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EDITORIAL NOTES.

Tar Distillation and the Private Bill Authorities.

THE gas industry has come to the assistance of the Government and of the country in the provision of benzol, toluol, and other things in a manner that has received the grateful acknowledgment of the Department that knows best what has been done, but not in any prominent manner of Parliament itself. The industry has been self-sacrificing in this matter. It has spent considerable sums of money on plant for obtaining essentials to the prosecution of the war. The time of skilled men has been devoted without stint to the work. What has been the gain of the industry? From the monetary point of view, the balance is on the wrong side; and what is more, the business of the industry, in some localities, has not been improved in consequence of the work. Beyond the plant and operations required for the extraction of benzol and toluol, there are to-day on gas-works hundreds of first-stage tar distillation plants at work that had no existence prior to the war. Had it not been for this prompt adaptability of gas-works, the country would have been in parlous state in respect of the rapid supply of the ingredients necessary to the making of high explosives. The tar distillers themselves had not the capacity for dealing with the crude tar for the separation of what was required at the rate at which it was imperative the work should be carried out. Even had they been in the position to deal with it rapidly, transport conditions would have stood in the way. Our readers know all this; and we want the Parliamentary Private Bill Authorities to appreciate it, and to understand that what has been done, and what must continue to be done in the future, constitutes an invaluable asset to the country.

There is good reason for desiring that the Private Bill Authorities should recognize this. The Plymouth and Stonehouse Gas Company's Bill has been before the Unopposed Bills Committee; and one of the proposals of the Bill is that the Company should be empowered to purchase an existing tar distillation plant, with the view to carrying on the distillation not only of their own tar, but that of other gas undertakings in Devon and Cornwall. The Company ask for no monopoly; they only wish for the authorization so far as parliamentary authorization is necessary. The clauses in question have passed the Unopposed Bills Committee of the House of Commons. The Alkali Manufacturers' Association did not put in any formal opposition, but wrote to the Deputy-Chairman of Committees (Mr. Whitley) asking him to protect their interests, which is a most irregular proceeding, adopted (so it is said) upon the ground that the country is at war. When the Bill was before the Committee, Mr. Ernest Moon, K.C., Speaker's Counsel, said the proposal was "a little bit outside the "ambit of gas-works;" but he was not in any way hostile. The Alkali Manufacturers' Association, in their letter, said that they "relied upon the Committee not to permit any "departure from precedent." Is the proposal outside the ambit of gas-works? Is the proposal any real departure from precedent? We very emphatically maintain that the answer is in the negative. It has been proved by the war, and by the requirements of the dye and colour industries, that there is pressing need for extending the operations of gas-works in the direction proposed by the Plymouth and Stonehouse Gas Company. Long before any question was raised, there were gas undertakings that, in the natural course of things, had been engaged in tar distillation on the large scale; and nobody ever dreamed that this was not one of the lines of development of the gas industry, and that any undertaking could not enter into such arrangements as were thought fit and proper to secure the most remunerative return upon its residual products. There is nothing outside "the ambit of a gas-works" in what the Plymouth Company are contemplating; there is no departure from well-established working precedent. It is simply an enlargement of pre-existing operations elsewhere; and it is in no wise outside the judgment of the Joint Committee of Parliament who considered in detail the whole question of policy. The Private Bill Authorities know well enough that this is so.

Mr. Moon assures the industry that he is "not hostile." We should be very sorry to think that he personally was so. But the industry cannot to-day, amid the work it is doing for the Government and the country in connection with the recovery and development of essential products, forget the parliamentary history of this residuals question, and the deliberate manner in which "Model Clauses" were framed—by whom? and at whose instigation?—which really reduced the inquiry and decision of the Joint Committee to mere travesty and gross injustice. Mr. Moon also asked whether the Company had had any negotiations with the Alkali Manufacturers' Association? Why should they? Why should they enter into negotiations with those who have—not on grounds of public policy, but self interest and gain—proved themselves inimical to the economic development of the residual products business of the gas industry? And since the error was committed of departing from the considered decision of the Joint Committee, the situation has entirely changed, and many things have been proved and illustrated, through the work of the gas industry in connection with the war. One thing is that the country needs the utmost development of plant to locally deal with the secondary products resulting from the carbonization of coal, and another thing is that, though the gas industry, by washing its gas, has enriched its tar, the tar distillers have not, generally speaking, dealt fairly with those who, through their limitations, have been unable to put down a dehydrating plant.

The Private Bill Authorities have now upon them the responsibility—the serious responsibility—of deciding here and now between helping forward the national interests or the private interests of the chemical manufacturers through imposing restrictions upon the gas industry. Supposing—we put the question on no stronger ground—the gas industry, in the event of the Private Bill Authorities continuing to deprive it of complete freedom in disposing of its residuals to the very best advantage, unpatriotically declined to continue to extract benzol and toluol from its gas, or refused to put forth efforts to work with that efficiency that the Ministry of Munitions says is so necessary for the supply of high explosives to this country and her Allies, could the chemical manufacturers and the tar distillers themselves supply the needs for the chemicals required? The war has compelled us all to take a larger view of things, and not be hampered by narrow considerations and prior conceptions. The scheme the Plymouth and Stonehouse Company are proposing is for the economic working-up of tar in Devon and Cornwall; and this will be something to the national as well as local benefit. Is it the duty of the Private Bill Authorities to rob the gas undertakings of the economy, and the country of the benefit to be derived from economy? We leave them to supply the answer. The Unopposed Bills Committee of the House of Commons have refused to take upon themselves the responsibility. This commits the final decision to the judgment of the Lord Chairman. Before that judgment is given, if the Lord Chairman, Mr. Whitley, Mr. Gray, and Mr. Moon would step round to the Ministry of Munitions, they could learn something there that would, we think, turn the balance of favour from the private interests of chemical manufacturers to those that are of real national importance.

Renewal of Sulphate Export Licences.

Good tidings come from Mr. D. Milne Watson, the Chairman of the Sulphate of Ammonia Association. The irresponsiveness of a large part of the British farming community to the sulphate of ammonia provision made for them, through the stoppage of licences to export, has resulted in congested stores, caused producers considerable inconvenience, and made working more uneconomical than it would otherwise have been. This was the result that was fully expected by the producers and merchants, who know the exact position of demand in relation to supply in this country, and who from past experience were aware that home farmers were not at all likely to be moved to commence an immediate patronage of sulphate of ammonia to an extent that would be about equal to the normal absorption of British production at home and abroad. Under the circumstances, it would have been excellent had home demand played such a good part, as this would have been of splendid augury for the sulphate market in the times ahead, and would have relieved the producers of much care as to the future. However, the very drastic measures directed to the provision and conservation of home supplies have been proved to have been superfluous and a mistake; and, in effect, the Fertilizers' Committee of the Board of Agriculture quite frankly acknowledge this by the announcement now made that they are moving in the direction of granting relief.

It will be remembered that quite recently producers were resenting what looked very much like a promise of preferential treatment, on the part of the Board of Agriculture, in respect of the granting of licences for France to certain producers who were embarrassed by stock accumulations. The Sulphate of Ammonia Association pointed out the unfairness of this not only to producers generally, but to French purchasers who had entered into contracts prior to the issue of the export prohibition; indeed, the Association have not, at any opportune time, relinquished their endeavours to secure relief from what they knew quite well was an unnecessary action—at any rate to the extent of totally refusing the grant of licences. We could quite appreciate every effort being made, by the refusal of the grant of licences in suspect cases, to prevent sulphate of ammonia reaching enemy countries. However, when making recommendations as to home prices for April and May [as seen by the correspondence with the Board of Agriculture reproduced elsewhere], the Sulphate of Ammonia Association again urged that the time had arrived when producers of sulphate of ammonia should be released from the restrictions under which their position was rapidly passing from bad to worse. In reply to this, the Fertilizers' Committee stated that, with the view to relieving the congestion in the producers' storage accommodation, it had been decided to grant *all* applications for licences for export to France, and, what is more important, a recommencement has now been made with the consideration of applications for export to any approved destination and consignee.

This is all that is desired and all that is required, as sulphate of ammonia makers are patriotic enough to voluntarily consent, if necessary, to reserve a sufficient supply for home use; and it is quite certain they do not desire that any part of their production shall reach enemy countries by devious routes. The question of the reservation of supplies for home consumption, however, is hardly one that can again obtain; for the granting of export licences is one thing, the securing of tonnage for transporting the material is quite another. Freights, too, and the (for some countries) advanced season for manuring, are sure to cause a double check on overseas business. However, the relief now granted is a gain; and we think the experience of the experiment that has been made will ensure that there will be no repetition of the complete withdrawal of licences for the export of sulphate of ammonia.

The Coal Situation.

The coal position is getting into a greater tangle than ever; but we are not so gullible as to think that the situation is entirely—although partly—due to the circumstances that are manifest, and those that are paraded with a persistence that shows there is anxiety that they shall be accepted as the sole causes of the prevailing condition of affairs. Shortage of output, snow storms and drifts, gales, and dislocation of the means of distribution, are all contributory to the reduction of available supplies; on the other hand, the principle guiding the Coal Exports Committee has been stated to be that, apart from our Allies, coal shall not be permitted to leave these shores while there is a shortage for home consumption. That there is a deficiency is proclaimed far and wide from every platform of which the coal people have command; but still licences are granted for export to neutral countries. We, of course, are fully aware that the amount of coal now being raised is considerably less than before the war; but we also know that in 1915 nearly 30 million tons less than in 1913 were exported, which is an amount that goes a long way towards compensating for the deficiency from the normal output. However, the colliery owners assure the country that there is a considerable shortage of output, and that they cannot keep pace with the home demand. This being so, there should be a further refusal of export licences to neutral countries. The Board of Trade Price of Coal Committee, in their report last year, said: "We are well aware that any interference with exports must be attended by a certain dislocation of trade; but, on the other hand, we are convinced that of the two evils this is less than the loss inflicted by a chronic condition of scarcity and inflated prices at home."

It seems pretty certain that there is something in addition to shortage of output and disorganized distribution at work which is not so manifest, and about which there is not public profession. Colliery owners do not like the restrictions of the Price of Coal (Limitation) Act. Those among them who are not patriotically inclined, and not content with a fair profit, would far sooner dispose of their output at unfettered prices to countries abroad, or put as much of it as possible upon the open market, than be bound to contract prices. Sir Arthur Markham, in the House of Commons the other day, assured the President of the Board of Trade that the Act was being evaded, and suggested that an Amending Bill should be introduced, providing that the average price of each quality of coal sold during the twelve months preceding the war should be substituted for the "corresponding" price. Mr. Runciman, however, doubted whether amending legislation was desirable; perhaps it is not in precisely the terms Sir A. Markham suggests. But certainly something is required to remove the indefiniteness which now exists, and which has been intensified since the Board of Trade began indulging in interpreting the provisions of the Act. But subtlety has a large part in coal transactions; and the factor has been brought into play more than ever before since the operation of the restrictive legislation regarding prices. From various gas and electricity undertakings, we learn that many collieries which have formerly been in the habit of sending in quotations are refraining from doing so in respect of the new invitations for tenders, or are largely reducing their offers. In one case there was absolutely no response to the invitation for tenders; in another instance, only a tenth of the quantity usually quoted for was offered. What is the meaning of this? What is causing it—in part, at any rate?

The colliery owners are well aware that there will be no difficulty whatever in disposing of any amount of coal outside contracts, and that the smaller the amount they have to supply under contract, the larger the quantity that will be at liberty for the open market. They know that those who do not get their requirements filled under contract will have to buy at enhanced prices elsewhere; and this supplies a basis for current business policy. Several undertakings have had to make purchases outside their contracts; and there has been ready buying of considerable quantities in this way. It is certain that, in a measure (we are not, of course, prepared to say wholly), "shortage of output" is a thin disguise for additional profit-making movements. Then there is another suggestion, and in this there is likely to be a good deal of truth. It is that colliery owners are deferring entering into contracts until July, so that they can take advantage of the prices ruling in the corresponding month of the prescribed year—that is to say, in July, 1913, instead of those that prevailed in any of the months from March to June, 1914. The success of this ruse would enable the coal owners to secure an additional 1s. 6d. to 2s. per ton on some varieties of coal. Then a further attempted overriding of the Act is that it is proposed to provide in contracts that any rise in wages, working costs, &c., recognized by the Government should be added to the contract price—that is to say, although the law as to price is one thing, the colliery owners, notwithstanding no amendment of the law has been made, wish to go beyond it in the event of certain contingencies materializing. We hear, further, that quotations for coal

have been made that are 1s. in excess of the standard price of 4s. per ton upon the corresponding prices. In this connection, sub-section 3 of clause 1 of the Act should not be overlooked. It provides that if any person sells or offers for sale any coal in contravention of the section, he shall be liable on summary conviction to a fine not exceeding £100, or, at the discretion of the Court, to a fine not exceeding treble the amount by which the sum paid or payable for any coal sold by him in contravention of the section exceeds the maximum sum which would have been paid or payable for the coal if there had been no contravention of the section. Mr. Runciman does not appear to have heard of any of these attempted evasions of the Act on the part of coalowners. It would be as well if readers supplied him with the facts associated with endeavours to secure something beyond what is provided by the Act. A further proposal is that deliveries are to be made in equal quantities throughout the year, and not 40 per cent. during the summer and 60 per cent. during the winter, as heretofore. Complaint cannot, in these times, be made of this condition, except that it may be awkward for those with restricted storage. We must not forget winter's coal demands and winter's traffic difficulties during war time.

While these things are going on under the very noses of the Board of Trade, a circular is issued by them urging householders to retrench in their use of coal, so as to leave as much as possible for distribution among the works and factories operating in connection with the war, and for export. Do not let us talk further of raising the quantity of coal exported until home requirements are completely met, and met in a straightforward manner, more especially in the directions where coal has hitherto been supplied under contract. In regard to gas and electricity undertakings, and possibly it is the same with other concerns engaged upon munition work, the District Coal Supplies Committees appointed by the Board of Trade a short time since do not appear to have yet exercised much influence in assuring full supplies. Perhaps they have not been long enough at the work to produce any substantial influence. It is to be hoped, however, that they will not be much longer in disclosing some utility in their appointment. As it is, complaint of unfulfilled contracts, and of stocks fast running down, reach us from many quarters. Hence the important deputation of representatives of the gas and electrical interests that waited upon the Board of Trade last week [as referred to elsewhere in this issue] to discuss several matters affecting the coal position. Mr. Runciman was not there to receive the deputation; but Mr. C. F. Marwood, who did so, is going to confer with him to see what, if any, steps can be taken to improve the present state of things. The sooner improvement is effected the better. It is pretty clear that, internally, there is much going on secretly that does not make for national stability and the general well-being.

In the Good Time Coming.

The address which the new Chairman of the Council of the Society of British Gas Industries (Mr. H. M. Thornton) delivered to the members last Wednesday was a composition that was peculiarly appropriate to the times and to his audience. In the present, things are in all conscience so dreary that the rays of a cheery optimism such as we find in this address afford a very welcome relief. The subject was: "The Industrial Outlook, and its Relation to the "Gas Industry;" and Mr. Thornton made good survey, provoked little adverse criticism, but a large amount of encomium for his work. Amid the clash of arms, the noise of guns, sorrows produced by relentless war, and heavy drafts upon our resources, vitalizing forces are operating to the development of a new British Empire through industry and commerce, which development will bring into productiveness much that has been neglected and rejected in the past, and that might have added earlier and immeasurably to our prosperity. It is strange that war should have been necessary to bring home to us the extent not only of our power and resources, but of the importance of the national mistakes of a now past day, and the means whereby can be made retrievable much that would have been otherwise irretrievable. All through the piece, we have marvellous contrasts, in relation to the past, the present, and the future—so far as we can from the present form any conception as to what will take place in the future.

For certain of the contrasts, we have only to consult Mr. Thornton's address. He points with pride to the financial position of Great Britain. We have been very largely the bankers of the world; we have invested considerably both at home and abroad in the developments of civilization, and in accelerating progress. What has been done could not have been accomplished without accumulated wealth; the drafts on finance that have been made since the war started could not have been borne, and yet have left the country in anything but despondent mood, had wealth not been so great, and had our resources not been so tensible and flexible. Note the contrast. This position has been created while there has been a remarkable laxity abroad in the country, and while succeeding Governments have been content to fritter-away much time over their pet schemes, and to leave more vital matters influencing internal development of strength to just who cared to interest themselves in them, and so to profit themselves and the country. The financial strength of the country is not of the Government's making; it is wholly due to private enterprise, and to nothing else. Never was there a Government of a front-place power who could lay less claim than ours to having contributed to the creation of national wealth; never was there a Government of an important power who have, by the sin of omission, done more than ours to obstruct the full development of a country's resources, while offering absolute freedom to what are now enemy countries to come in and, as Mr. J. H. Balfour Browne, K.C., said at the meeting last Wednesday, "honeycomb" our industry and trade by their intelligently devised schemes. Their success is the best memorial as to British neglect of opportunities. Mr. Thornton in his address showed how the Empire's resources have, through their ingenuity and our remissness, been placed, with almost gracious indifference, at their disposal. They have smiled, and proceeded to the congenial task of enriching themselves at our expense. In a sense we ought to be grateful to them; for had it not been so, and had the war not been the disclosing medium, the Government would never have been shaken from their rock-bound complacency as to the want of protection, encouragement, and assistance to the wealth-producing sources of home industry and commerce, and things would have continued very much in the same way as before. But now the Government are seeing that, had there not been the neglect of the resources of the Empire, had there not been the rejection of the opportunities that were lavishly offered to the nation, the wealth enjoyed would have been much greater than it is; and the country would have been in a still better position for prosecuting the war with less feeling and knowledge of the weight of the burdens, which burdens have been made heavier through the lamentable unpreparedness for war, and the enhanced cost of applying the remedies. In whatever direction we look, the contrasts between the present and the past are very remarkable.

Notwithstanding the great debt that is being created by the war, and the heavy obligations that are being imposed by it upon the nation, the awakening of the country and the Government to our industrial and trading opportunities is a distinct gain. But what is being done is what should have been done long since. We shall never be able to recover what has been lost in the past; but there can largely be recovery of resources that have been allowed to drift away to the benefit of others. Manufacturing and trading capacities are resources; the measure of the neglect of their development is the measure of the benefit of that neglect to rival countries. The prodigal use of our raw materials has not been to our economic advantage. The indifference to the proper organization of the means of development of trade at home and abroad has been a gain to the enemy countries. The want of systematic technical education of men has been a loss of man power and skill and productivity. The inadequate use of our technological establishments where applied science is taught has also been a loss. The spasmodic and comparatively feeble work in the way of industrial research has been to the inestimable advantage of our manufacturing and commercial rivals. In future we must cultivate and utilize all these resources, so that the nation's productivity may be increased, and in order, too, that the country and Empire may be more strongly fortified against any attempted repetition of the hitherto successful industrial and trade strategy of Germany. We have also to bring about a better understanding between capital and labour, through the interest of the latter in the profits resulting from the productions of his toil. The lessons that have issued from the state of war have been great; and there must be complete application of them in the future.

All these matters and more Mr. Thornton dealt with; and

he moulded from his examination of the current situation, of the problems confronting, and of the prospect of their efficient handling now that an awakened Great Britain and her Dominions beyond the seas are dealing with them, a position excellent in its potentialities in respect of an increasing prosperity. But there is preceding and continuous hard work to be done. The new conditions are not going to develop without motive force; and we now know, from the recognized failures of the past, of what this motive force must be composed. In the hoped-for good time coming (when our enemies have been economically crippled, and we are fitted better than ever before to take a larger place as world producers and suppliers), the gas industry—its gas manufacturers and its makers of gas plant and appliances—will have a material part. The gas industry by its inherent conditions is prepared for that part; it would be better prepared had it a stronger central organization representative of all interests. Cost of raw materials will, of course, largely set the pace of progress and of the expansion of serviceability; but all that is otherwise required for national industrial and trade development is also required for the advancement of the gas industry. Research particularly so. We are glad to see that the members of the Society of British Gas Industries appreciate this, and are trimming their sails accordingly. Mr. Thomas Glover (London) made an interesting suggestion in the discussion when he referred to the need of a Central Technical Gas Research Association. The fortunes of the members of the Society have an inseparable relationship with those of the gas supply industry. In the industry there has previously been scientific research—some is going on now; but it has been, and is, on a comparatively trifling scale. It is time that something much more serious was done; for the industry will need in future all the economy and all the advantages that research can confer.

We hope all is coming true that is implied by the results of Mr. Thornton's wide study of the question of our industrial future from the basis supplied by the ascertainable facts of the past and present and the disclosures of the last twenty months. If the ultimate issues are not of the generous character that they might be, then the fault must lie at the door of indolence; and we must be prepared for a sweeping industrial and trade victory over us on the part of our enemies, who will leave no stone unturned in the effort to re-establish and even improve their economic fitness.

Redeemable Gas Stocks.

We live in strange times, and times of strange ideas. Through the inordinate times, abnormal financial conditions have been set up. Parliament in its wisdom last year, in order to afford some relief to statutory companies in connection with their capital obligations, passed an Act empowering them to issue debenture stock already authorized as redeemable stock, the liquidation of which, prudence suggests, should be by the provision of a redemption fund. Now it is stated that the Act does not apply to statutory gas companies working under a sliding-scale price and dividend. The sliding-scale which is such a boon to the consumers, it is hinted, puts on sliding-scale companies a disability so far as the issue of redeemable stock and the provision of a redemption fund are concerned. It is a singular condition that the boon should be regarded as an obstacle to the doing of what is the best possible in placing, under new circumstances, a gas undertaking in the soundest financial position. Now by no possible exercise of the imagination can we see how consumers would be injured. Those administering sliding-scale gas undertakings do so in the interests of both proprietors and consumers; and they are not likely to do anything that will injure the one or the other. It is thought by the Private Bill Authorities that the provision of a redemption fund will mean a higher price of gas; if it really does so, it also means a reduction of the dividend for the proprietors. But looking at all the facts squarely in the face, will the proposal have any such effect? Gas undertakings are too often in more or less debt to their bankers; and interest is high, and will continue high for many years. Accommodation from bankers has to be repaid. Furthermore, higher rates of interest have to be paid for loans from the public; and easier terms can be obtained for redeemable stocks than by other means. If ordinary stock is issued, dividends are, as a rule, at a higher rate than interest on loans, through the preferential rank and stronger guarantee of the latter. Taking these conditions into consideration, how is the gas consumer likely to permanently suffer through the granting of redeemable stock powers and redemption funds compared with the alternatives? It is more probable that he would suffer through the permanent infliction of heavy interest or dividend bearing stocks. It therefore seems to us to be akin to "straining "at a gnat and swallowing a camel" to make the sliding-scale condition an obstacle to gas companies raising money by way of redemption stock, and providing a redemption fund. No decision has so far been come to. The Unopposed Bills Committee say—the matter was discussed on the Plymouth Bill—that, in view of the applications being made to Parliament by gas companies this session for redeemable stock powers and redemption funds, the matter is under the consideration of the Lord Chairman, because it is necessary that some lead should be given to Committees. It is the redemption fund that is the difficulty. There is another point, in that the General Act of last year only refers to debenture stock already authorized; and gas companies are asking for new powers as to redeemable stock. If it is good for statutory companies to have authority to issue as redeemable stock debenture stock already authorized, it will be an equal advantage for Parliament to authorize the issue of fresh redeemable debenture capital. The administrators of gas companies are only solicitous to do the best financially for the undertakings under their direction, and therefore what is best financially for the consumers—particularly in the case of those concerns under the operation of the sliding-scale. Financial conditions have changed for gas undertakings as for other enterprises; and this surely should be recognized, and Parliament act accordingly.

Pooling Railway Waggons.

No definite steps have been taken to bring about the pooling of private railway waggons. The proposal has so much about it that is unjust, and the opposition so much about it that is based on justice, that it is hoped the scheme has been finally abandoned. The pooling of railway companies' waggons is quite another matter; and when pooling by them is a voluntary matter, so much the better. Last week the announcement was made that five important railway companies have entered into a working arrangement under which their waggon stock will be organized so that the maximum use is made of it. The Companies are the Great Western, the London and North-Western, Lancashire and Yorkshire, Midland, and North-Eastern. The list shows that the principal industrial areas will be largely covered by the scheme, which, however, does not comprehend the whole of the goods rolling stock. For example, rolling stock specially built and fitted for local and special requirements is to be exempt from inclusion. The gas industry is hoping this arrangement will result in more regular deliveries of coal and other goods; but this will depend entirely on the question of the efficiency of the organization set up to ensure that there is an adequate supply of waggons for traffic on all parts of the participating companies' systems. Given this organization, there should be all the good results from it that Mr. J. W. Broadhead predicted when he brought the matter of waggon pooling before the Society of British Gas Industries in March last year—saving of labour, quicker transport, and reduction of costs. As manufacturers, the members of the Society are particularly interested in all measures taken to facilitate transport; and there will be gratification among them over this first attempt to produce greater efficiency. The efficiency, it is asserted, is capable of still further improvement if the necessary labour could be secured to repair the large number of crippled waggons now standing idle.

Trade with Australasia.

A visit which, there will be unanimity of opinion, is particularly opportune at the present time—when manufacturers on this side are wishful of ascertaining the best methods by which to capture business hitherto done by enemy firms in other parts of the world—is that of Mr. G. T. Milne, His Majesty's Trade Commissioner for Australia. Firms may note that Mr. Milne will be in London on several days this month, and that appointments for an interview may be made on application to the Director of the Commercial Intelligence Branch of the Board of Trade, at No. 73, Basinghall Street, E.C.—quoting the reference number C.I.B. 4266/16. Among the matters in Australia in regard to which he

is prepared to give information and advice are the appointment of agents, methods of marketing and distribution, terms of payment, names of probable buyers of British goods, statistics of imports, and rates of Customs duties. With reference to the business in New Zealand, the "Board of Trade Journal," from which the intimation just given is extracted, quotes a report by Mr. W. G. Wickham, recently Trade Commissioner there, dealing with imports of metals and hardware in 1914. In this it is shown that the proportion of these imports supplied by the United Kingdom was over 77 per cent.; but if the large item of semi-manufactured iron and steel is considered apart, the proportion is reduced to 70 per cent. As regards this semi-manufactured iron and steel, the United Kingdom supplied 94 per cent. of the total imports; and another 3 per cent. was furnished by Canada. "But," it is added, "on a large proportion of the items included, there is an *ad valorem* duty of 20 per cent. against all foreign makes, so that it is remarkable that all the semi-manufactured iron and steel imported was not supplied by the British Empire." There is thus evidently substantial room for improvement in this direction. In connection with the subject, it may be pointed out that the Commercial Intelligence Branch of the Board of Trade are also inviting applications from manufacturers and exporters of United Kingdom goods who are desirous of extending their trade in other markets abroad.

Local Authorities and Allowances.

With the object, among others, of legalizing the proceedings of local authorities with regard to allowances or payments made to officers and servants who may have joined the Colours, and to bring their practice into line with that adopted in the case of Civil servants, there has been introduced the Local Government (Emergency Provisions) Bill, which was read a second time in the House of Commons last Wednesday, and is down for the Committee stage to-day. It is provided that, with the exception of the sections affecting superannuation schemes, the measure shall have effect only during the continuance of the war, and afterwards for any period not exceeding a year that the Local Government Board may fix. There are clauses which are intended to effect various economies in time, labour, and money; but the principal portion is that which sets forth that while an officer or servant is serving with His Majesty's forces, any local authority may pay "a sum which shall not, without the sanction of the Local Government Board, exceed his civil remuneration after deducting therefrom the amount of his naval or military pay and allowances; and, in the event of his death, for a period not exceeding twenty-six weeks after the date of his death, pay to his widow or other dependants sums calculated at the same rate as those previously paid." In fixing the sum to be paid to the widow or other dependant of a deceased officer or servant, regard shall be had to any pension or other sum payable to them out of any public or charitable fund. It shall not be incumbent on the local authority to reduce any payment to an officer or servant on the ground that during his service with the forces he becomes entitled to increased naval or military pay in consequence of receiving a Commission or promotion in rank. These provisions shall apply to those who before the passing of the Act joined the forces with the sanction of a local authority; and any undertaking given shall be binding on the local authority to the extent to which it could have been given had the Act been in force at the time. Should an officer or servant die while with the forces, or from wounds or disease resulting from such service, the local authority shall have, and shall be deemed always to have had, power to make any payments which could have been made under a superannuation scheme. All time spent with the forces shall reckon as service for superannuation purposes. For calculating contributions and superannuation allowances, the salary or wages and emoluments during service with the forces, shall be reckoned as the amount which the man would have received during that time had be remained in the actual service of the local authority.

The programme of business for last night's meeting of the Society of Chemical Industry (London Section) included, as one of three papers to be read, a communication by Mr. J. S. G. Thomas, B.Sc., A.R.C.S., entitled "The Evaporation of Naphthalene in Dry and in Moist Coal Gas." Mr. Thomas, it may be remembered, was the author of a valuable article on the "Evaporation of Naphthalene in Air and Coal Gas Vapours" which appeared in the "JOURNAL" for Dec. 28 last (p. 701).

PERSONAL.

At a meeting of the Directors of the Coatbridge Gas Company last Tuesday Mr. DAVID LAMBIE, who has been employed by the Company for almost thirteen years as Accountant, was appointed Secretary and Treasurer.

In the list of members of the Industrial Fuel Committee of the British Commercial Gas Association, published in the "JOURNAL" for March 21 (p. 632), the name of Mr. RALPH HALKETT, of Glasgow, was inadvertently omitted.

In a paragraph under the "Personal" heading last week, it was stated that Mr. HARRY E. JONES had been elected a Vice-President of the Institution of Civil Engineers. This announcement was somewhat premature, as the formal election takes place next week. Mr. Jones's name has, however, been selected by the Council for inclusion in the ballot-list issued to the members.

We learn that Mr. MARK NEWSOME has been appointed Engineer and Manager of the Tyldesley Gas and Water Department. Mr. Newsome was trained at the Leigh Gas and Water Works under Mr. James Gibson, with whom he served four years' pupilship, and is at present engaged with West's Gas Improvement Company supervising the erection of vertical retort installations. Mr. Newsome holds first-class City and Guilds of London certificates in "Gas Manufacture," ordinary and honours grades.

OBITUARY.

A short time ago, news was received by the Auckland (*N.Z.*) Gas Company of the death in Japan of Mr. E. B. PARSONS, who retired seven years ago, after long service as Secretary of the Company.

On the 26th ult., the death occurred of Alderman WILLIAM ARMITAGE, J.P., the Chairman of the Doncaster Corporation Gas Committee, and a member of various other Committees. Deceased, who was 74 years of age, had been a member of the Town Council for nearly thirty years, and had lived in Doncaster (where he carried on business as a hardware dealer) for some ten years longer than this. He was Mayor in 1907. His vigour as a speaker will be recalled by those attending the conferences of the British Commercial Gas Association.

But little over two years ago, Mr. JAMES BURCH, owing to age and the infirmity of deafness, felt compelled to retire from the position he had held for upwards of 46 years as Secretary of the Canterbury Gas and Water Company; and now comes the news of his death, at the ripe age of 87. He led an extremely active life, and filled various public offices; but it is safe to say that no work which he did was better appreciated than that performed on behalf of the Gas and Water Company. At the last Board meeting which Mr. Burch attended as Secretary, the Directors passed a resolution recording their "high appreciation of the services he had so faithfully rendered to the Company."

WILLIAM FORD.

IN the early morning of last Tuesday, at the age of 77, Mr. William Ford passed peacefully away at his residence, Glen Farg, Hartburn Lane, Stockton. He had been in failing health for some time; but he succumbed finally to an attack of bronchitis, which had confined him to his bed for some days.

Though having a far wider circle of friends in the industry, Mr. Ford was best known among gas men in the North of England, having occupied the position of Gas Engineer and Manager of the Stockton-on-Tees Corporation for nearly half a century. He was born in Scotland and educated at Perth, and for a short time on leaving school went into the City Architect's office. But having a strong leaning towards engineering, he was apprenticed in an extensive Perth engineering and millwright's business, after which he had an engagement with Messrs. Laidlaw and Sons, at Glasgow. From there, he joined the works' staff of the then City and Suburban Gas Company of Glasgow, of which Mr. H. Bartholomew was Engineer. Three years were spent here; and then Mr. Ford became Manager of the Newry Gas-Works—a position he occupied for nine years. In 1868, he left Ireland to take up the appointment of Engineer and Manager of the Stockton-on-Tees Gas-Works, where he succeeded Sir (then Mr.) Corbet Woodall. From the position of Manager he retired last June, after 46 years' service; and he was then retained as Consulting Engineer—Mr. Matt Dunn being appointed Manager. The Corporation were pleased to recognize Mr. Ford's good work in the manner named; and shortly after his retirement he was presented with an illuminated address of thanks on behalf of the Council. How well his sterling qualities were appreciated by the staff and workmen was frequently manifested; but two occasions may here be particularly referred to. On the completion by him of 25 years of service, and as a token of the good feeling and esteem which existed between the workmen and himself, the employees presented him with a set of silver fruit dishes and an illuminated address; and, again, the completion of his forty years' of management was celebrated by the presentation by the staff and the

employees of a suitably engraved silver salver. Mr. Ford, while Manager, saw the Stockton gas undertaking grow from 3000 consumers, and an annual make of 54 million cubic feet of gas, to 17,500 consumers and a yearly output of 429 millions. He must, of course, as these figures show, have carried out in his time a great deal of constructional work at Stockton; and, in addition to this, his advice was much sought as a consulting engineer by those responsible for the administration of other gas undertakings. His own Committee's opinion of him was voiced by Alderman Harrison (the Chairman), when he stated in the Council Chamber that "Mr. Ford was a gas manager of the greatest eminence." At a meeting of the Town Council on Friday, the Mayor (Mr. B. Watson) said Mr. Ford's whole heart was in his work. He retained his interest up to the end; and no public body had had a more loyal and conscientious servant. A vote of condolence was passed with Mrs. Ford and family.

Mr. Ford joined the British Association of Gas Managers in 1868, and was a member of the Council in 1879—when he was also President of the North of England Gas Managers' Association, a position which he occupied for a second time in 1908. Though the oldest member of the Masonic Lodge of Philanthropy, which he joined in 1871, he never took office, but continued his connection with the Lodge up to the time of his death. He is survived by a widow, a daughter, and a son—who went out to the Vancouver (B.C.) Gas-Works, but at present holds a commission in a Canadian regiment.

Deceased was buried on Friday in the Oxbridge Cemetery; the large and representative attendance at the funeral including the Mayor of Stockton, members of the Corporation, many officials, and a number of gas managers.

EXPORT LICENCES FOR SULPHATE.

Sir,—We have pleasure in enclosing copy of letter we have just received from the Board of Agriculture with reference to the question of export licences for sulphate of ammonia, which we think you may care to notice. We also enclose copy of our letter of the 23rd inst., to which the Board of Agriculture are now replying.

D. Milne Watson, Chairman,
Sulphate of Ammonia Association.

84, *Horseferry Road, Westminster, March* 30, 1916.

[Enclosure.]

The Right Hon. F. D. Acland, M.P., *March* 23, 1916.
Board of Agriculture and Fisheries,
3, St. James Square, S.W.

Dear Sir,—In reply to your letter of the 22nd inst., the question of the price at which sulphate of ammonia for agricultural purposes is to be sold in April and May was considered by my Committee to-day; and it was unanimously decided to recommend all manufacturers of sulphate of ammonia not to ask higher prices for these months than £16 15s. per ton to farmers and £16 5s. to merchants, bags free, f.o.r. at works. Seeing that makers generally have loyally co-operated with us in carrying out our suggestions as regards January, February, and March, we have every reason to think that there will be little difficulty in obtaining a general acceptance of these prices for April and May.

We trust, therefore, that your Committee will see their way to remove the existing restrictions on export without further delay. Even if licences are granted immediately, it will be many weeks before any quantity of sulphate can be moved from the works, owing to the difficulty of securing freight.

D. Milne Watson, Chairman,
Sulphate of Ammonia Association.

March 30, 1916.

Sir,—I am directed by the Fertilizers Committee of the Board of Agriculture and Fisheries to refer to Mr. Milne Watson's letter of the 23rd inst., and to say that they are glad to learn that your Committee have decided to recommend all manufacturers of sulphate of ammonia not to ask higher prices during April and May than £16 15s. per ton to farmers and £16 5s. per ton to merchants, bags free, f.o.r. at works.

I am to inform you that, with a view to relieving the congestion in the storage accommodation of the various producers, all applications for licences to export to France have now been allowed; and it is proposed to recommence the consideration of applications for export to any approved destination and consignee as from the 1st prox.

(Signed) H. B. Houseman,
for H. Chambers, Secretary.

Recent Wills.—Among wills recently proved is that of Mr. Thomas J. Carless, the Chairman of the Richmond (Surrey) Gas Company. He died on Jan. 26, leaving property valued for probate at £52,388. The will of Mr. Arthur K. Cæsar, formerly Secretary of the Whittington Gas Company, Derbyshire, has also been proved—at £23,684 net personalty.

Scottish Junior Gas Association (Western District).—Some disorganization of the postal arrangements has rendered unavoidable the holding over of our report of the annual general meeting of the Association, which was held on Saturday in the Royal Technical College, Glasgow, when the final sessional lecture was delivered by Professor Arthur Smithells, F.R.S., of Leeds University. The meeting was followed by the annual social.

GAS AND ELECTRICAL UNDERTAKINGS AND THE QUESTION OF COAL SUPPLIES.

A deputation representing gas and electrical undertakings went to the Board of Trade last Tuesday, to make representations as to coal supply troubles. Owing to Mr. Runciman's official engagements, he was unable to receive the deputation personally, and Mr. W. F. Marwood, C.B., the Second Secretary, acted on his behalf.

The difficulties experienced with regard to the supplies of coal at the present time were discussed; the principal points dealt with being: Shortage of supply; shortage of transport; the question of price arising out of the Price of Coal (Limitation) Act.

Mr. R. J. N. Neville, M.P., introduced the deputation.

The gas industry was represented by:

Mr. C. F. Botley, Hastings and St. Leonards Gas Company.
Mr. F. E. Cooper, Secretary of the Gas Companies' Protection Association.
Mr. W. T. Dunn, Secretary of the Institution of Gas Engineers.
Mr. Thos. Goulden, Chief Engineer of the Gas Light and Coke Company.
Mr. J. R. H. Jacobs, Secretary of the Southampton Gaslight and Coke Company.
Mr. A. A. Johnston, Engineer and Manager of the Brentford Gas Company.
Mr. H. E. Jones, Chairman of the Wandsworth, Wimbledon, and Epsom District Gas Company.
Mr. S. H. Jones, Engineer and General Manager of the Commercial Gas Company.
Mr. F. M'Leod, Secretary of the South Metropolitan Gas Company.
Mr. Reginald Neville, M.P., Chairman of the Brentford Gas Company.
Mr. W. E. Price, Engineer and Manager of the Hampton Court Gas Company.
Mr. D. Milne Watson, General Manager of the Gas Light and Coke Company.
Mr. Alex. Wilson, Glasgow Corporation Gas Department.

Electricity was represented by:

Mr. H. R. Beeton, Chairman of the Brompton and Kensington Electricity Supply Company.
Mr. E. Calvert, Hon. Secretary of the Associated Municipal Electrical Engineers (Greater London).
Mr. A. C. Cramb, President of the Incorporated Municipal Electrical Association.
Mr. J. S. Highfield, Consulting Engineer of the Metropolitan Electric Supply Company.
Mr. G. W. Partridge, Incorporated Association of Electrical Power Companies.
Mr. P. F. Rowell, Secretary of the Institution of Electrical Engineers.
Bailie W. B. Smith, Chairman of the Glasgow Corporation Electricity Committee.
Sir John Snell, Past-President of the Institution of Electrical Engineers.
Mr. C. P. Sparks, President of the Institution of Electrical Engineers.
Sir Albert Stanley, Managing-Director of the Underground Electric Railway Company (represented by Mr. A. Coveney).
Mr. W. C. P. Tapper, Stepney, Borough Electric Engineer and Manager.

The speakers were: On behalf of gas: Mr. D. Milne Watson, Mr. H. E. Jones, Mr. F. M'Leod, and Mr. C. F. Botley; on behalf of electricity: Mr. C. P. Sparks and Bailie W. B. Smith.

Sir Corbet Woodall was to have been one of the speakers, but was unfortunately indisposed.

Mr. Alderman Phillips, the Chairman of the Salford Corporation Gas Committee, Mr. R. A. Chattock, the Birmingham City Electrical Engineer, Mr. H. Wade Deacon, the Chairman of the Liverpool Gas Company, and other representatives of provincial gas and electrical undertakings were regrettably unable to reach the Board of Trade in time for the deputation, owing to the breakdowns on the railways caused by the storm.

Mr. Marwood thanked the deputation for bringing the matter to his notice, and for the information given. He promised to communicate with Mr. Runciman, in order to see whether steps could be taken to improve the present state of things.

QUARTERLY INDEXES TO THE "JOURNAL" VOLUMES.

In view of the shortage and enhanced cost of paper, and increased labour, printing, and postage charges, it has been decided to in future issue the quarterly indexes to the "Journal" only to those subscribers who express their desire to have them. It is proposed to keep a register of the names of those who signify such desire, and quarter by quarter a copy will be posted to them. In order that a calculation may be made as to the approximate number of copies of the index that will be required, readers are asked to send, not later than Saturday, April 15, a post-card expressing their wish to have their names recorded. Compliance with this request will prevent disappointment.

ELECTRICITY SUPPLY MEMORANDA.

THE administrators of electricity undertakings are not looking forward with any hopefulness to the financial outcome of the year upon which, in the case of municipal concerns, they have just entered, and, in the case of companies, have passed through the first quarter. For them, as for others, the conditions have been oppressive enough since the war started; they confront them now looking more irksome and ominous than ever. Many municipal electricity concerns are ending the financial year with balances on the wrong side; and the effect of this is seen in further increases in the price for current. The former 10 to 15 per cent. advances in price have in many cases proved their inadequacy; and now throughout the country undertakings are found adding a further 10 or more per cent. to the previous increases. In view of the fact that the financial year lately closed shows deficiency in many instances is proof that the extra advance in electricity charges will not, with still enhanced costs of material and labour, and the hardening of the other conditions that have helped to defeat the obtaining of a financial equilibrium, see the current year through with in the case of many concerns an income balancing the outgoings and capital and other necessary charges. The fact that charges must now be raised yet higher can be certified by a few simple cases. Birmingham is adding 15 per cent. to the lighting charges and 20 per cent. to the power rates. In regard to high-tension supply, the agreements now contain a coal clause; and, as opportunity arises, old agreements without the clause are now being terminated, and the new clause substituted. The Yarmouth Electricity Department reports a deficiency of about £6000 for the past year, notwithstanding that the charges have been raised. Lowestoft has resolved upon putting up the prices 10 per cent.; and Eastbourne is raising the lighting charge from 5d. to 5½d. per unit. Ipswich is increasing the price for lighting purposes from 4½d. to 5d. per unit; and the tariff for heating, power, &c., is to have 15 per cent. added, making an increase of 25 per cent. since the start of the war. Southampton and Burton-on-Trent are going up 10 per cent., and so is Ashton-under-Lyne; and, in this instance, 25 per cent. extra is to be charged for direct current for power and heating purposes. Dartford has incurred a heavy loss; and 20 per cent. is to be clapped on to existing prices. Sutton is advancing from the high price of 6d. to 7d. per unit. Epsom is also adopting 7d. per unit as its charge for private houses and business premises. For power, a flat-rate of 3½d. per unit is to be charged, with a sliding-scale descending to a minimum of 1½d. per unit for upwards of 3000 units. Public lighting is to be charged 4½d. per unit. We should be prepared to guarantee gas in these towns (even at current prices) showing an immensely superior illuminating, heating, and power value for money expended than electricity at its current rates. Without exception, we think it may be said, the electricity suppliers in the Metropolis have advanced their rates; some of them more than once. The Charing Cross Company find it necessary to apply to the Board of Trade for consent to advance their maximum rate in the City from 5d. to 5½d. per unit during the period of the war and for twelve months after. But the Court of Common Council apparently think that 5d. under any circumstances is quite a high enough charge for electricity; and they have declined to pass a report of the Streets Committee recommending that no opposition be offered to the Company's application to the Board of Trade.

The Flow to Higher Prices.

Coal Experiences.

Large buyers of coal such as are gas administrators need no telling that electricity undertakings must have suffered severely in respect of fuel costs under current conditions, notwithstanding the existence of the Price of Coal (Limitation) Act. As remarked in the foregoing paragraph, the current year is going to see electricity undertakings hit harder than they have been at any time in the course of the war. During the past war period, they have been largely or partly working with coal purchased by contract under pre-war prices, and now they have to pay the maximum prices that can be levied. And these for some undertakings include heavy freight charges, or charges considerably increased through the difficulties on railways and with cartage. Before coal is delivered at the generating stations, every charge is heavier now than it was before the war. In addition, there has been—although kindly things were said about coal contractors by electrical men at the joint conference last year of the gas and electrical interests—such shortage of deliveries at some electricity stations that there have had to be not inconsiderable purchases in the open market at the prices that can be commanded there. At the recent meeting of the City of London Electric Light Company, the Chairman stated that coal is now costing them 100 per cent. more than prior to the war, chiefly owing to increased freights; and supplies have at times been most difficult to obtain. Mr. Frank Bailey, one of the Joint Managing Directors of the City Company, was one of those who spoke generously at the joint conference as to the manner in which deliveries had been made; but much water has flowed under the bridges since then. However, for 1915 coal cost the Company about £14,000 more (approximately 40 per cent.) than it did in the part war year of 1914; and the Chairman of the Company says there is no prospect of early relief—on the contrary, expense will be greater this year. The Metropolitan Electric Supply Company have experienced a 50 per cent. increase in cost for coal of inferior quality, and which has been at times most difficult to get. Compared with 1914, their outlay for coal last year was £12,400 more. The dividend has, in this case, fallen to 3 per cent.; certain Directors have resigned; and a Committee have been appointed to examine the affairs of the concern. The Charing Cross Company also lament an increase last year of 50 per cent. upon the 1914 outlay. The Electricity Committee of the Bermondsey Borough Council report that they have had to purchase, outside their contracts, a quantity of coal at from 21s. 8d. to 27s. a ton. In this case, an invitation for annual tenders for coal elicited no replies. The present contractors, however, stated that they were willing to quote from time to time for supplies, and said they would *endeavour* to maintain deliveries at the rate of 110 tons per week. They could go no further than this. The price of Shipley peas now being supplied to the Committee is 24s. 8d. per ton; and the Council are purchasing as much as possible at this price. At Newport (Mon.) in the past nine months, the increase in the cost of coal has been £4000, half of which is due to the past three months, so that it is not difficult to see which way things are trending. Burton-on-Trent electricity concern reports an increase in cost of £2000 for the past year. These are only samples. For the large undertakings in some of the big industrial centres (we shall learn more about their experiences later), the additional cost must have been tremendous; and so it must have been for the concerns down south dependent on deliveries by sea. Some of those, too, that rely upon rail deliveries have had a very tight squeeze to get through this winter.

An Unjust Imposition.

Peculiar notions are resident in some council chambers as to what should be done in connection with war-imposed increased costs in the electricity departments. The additional expenses are obviously a matter that should be borne by the consumers; but there are some councils, suffering from an extraordinary twist of ideas, who are of opinion that any difficiency resulting, under present conditions, from supplying electricity below the total cost involved to a comparatively few ratepayers, and those generally the best circumstanced ones, should be borne by the ratepayers generally. In no other form of trading is this, or could it be, done. We have referred to this point on a previous occasion, and have interest in it because gas companies have to charge their consumers with the enhanced costs, and, under the policy of burdening the ratepayers with deficiency, on electricity trading, the gas consumers (who are also ratepayers) have to bear a double share of the imposition made in favour of electricity consumers. Another illustration comes from Bingley. Costs have gone up there the same as at other places; but the Electricity Committee pleaded in the Council that the question of increasing the electricity charges should be deferred for a twelvemonth. An amendment was moved that both the power and the lighting consumers should pay ½d. per unit extra. The undertaking has been in existence for two years; and, in resisting the amendment, a Mr. Dawson asserted that, when the concern started, there was not a single member who expected it would be able to pay its way for ten years. What a confession to make! Does a concern, with no prospect of making both ends meet for ten years, constitute fit and proper adventure for a local authority? He also declared—the electricity consumers should note this—that the amendment was a suggestion that the consumers should "pay double the price of gas." Yet the proposal was that only an extra ½d. per unit should be charged! He further asserted that, if the ½d. was added to current prices, some of the larger consumers would withdraw. It does not appear from this that in Bingley it would take much to cause the electricity consumers to revert to gas. Only by the Chairman's casting-vote was the amendment rejected; and so the ratepayers generally, including the gas consumers, are to bear the extra war costs of electricity. Where is the justice in this?

Collapses.

The electric supply industry is showing good capacity for maintaining its old-established reputation for unreliability. Readers will find references to recent failures of supply in the "Memoranda" for Feb. 1, 22, and 29. These only give published examples; but, through Council meetings, there are occasional leakages regarding similar occurrences. There is a case at Accrington. Complaint was lately made at a Council meeting as to the failure of the supply of electric power to mills and works in the town, "which caused stoppages and great inconvenience." The Chairman of the Electricity Committee is Alderman Higham; and according to the "Electrician," on complaint being made, he explained that "the electricity undertaking (which was a great success) was the victim of circumstances brought about by the war and things over which they had no control. The stoppages referred to were known to the firms; and they were not finding such fault as the members of the Council." Perhaps they know that little good would result from it, or perhaps they find recreation in the "great inconvenience" produced by stoppages. And, of course, as there was "great inconvenience," the stoppages must have been "known" by the firms without Alderman Higham saying so. Alderman Higham, too, agrees with Alderman Pearson, of Bristol [Vol. CXXXIII., p. 459], in saying that stoppages are brought about by "things over which they have no control." Alderman's Pearson's view is that "nothing can stop occasional

accidents of this character." But about the "great success" of the Accrington undertaking, the "Electrical Review" informs us that Alderman Higham also lately said that "if the gas plant was not doing all that was expected, it was due to inability to get suitable fuel for the producers, and to bye-products being commandeered. He anticipated a heavy and unavoidable loss on the year's working." Stoppages and financial losses are not usually taken as factors in making "great success." But in the human race there is found a wonderful diversity of opinion on any given subject; and this is so as to what constitutes success. There is Dublin again. The electricity undertaking there is not in smooth waters at the present time, as recent reports have disclosed. Now, on two occasions during the week ending on the 18th ult., streets, business establishments, and private residences in Dublin were left in darkness for considerable periods; and, naturally, report says, "much annoyance and inconvenience were caused." Another recent ugly event is a fire (which caused some £2000 damage) in the electric generating building of the Victoria Infirmary, Glasgow. An infirmary is not a nice place for a fire.

ITALIAN GAS COMPANIES AND THE WAR.

About a year ago reference was made in the "Journal" to the difficulties facing gas companies in Italy in consequence of the war; and our sympathy was cordially extended to our Italian colleagues, and the hope was expressed that their trials would be overcome. This, it will be noted, was before Italy had joined the Allies, which she did in May of last year, at a time when the military situation in the East was far from favourable. All this it is well to bear in mind, not only with a view of keeping a fair sense of perspective in appreciating at its full value the great assistance and valour of our Italian Ally, but also of obtaining a sympathetic outlook on the particular troubles of the Italian gas industry.

These exceptional difficulties are referred to in the report of the annual meeting recently held of the Società Italiana per il Gas, which lights Turin, Bergamo, and other towns, and with which are affiliated several other gas undertakings—such as Novara, Monza, Cremona, and Savona. English difficulties with coal and freight were bad enough; but in Italy the cost of coal rose rapidly from 12s. in February, 1915, to 24s. per ton. Freight, which before the war had been 7s., reached 70s. at the end of 1914, and ultimately touched the record figure of 90s. American freight had become prohibitive. Further, there was the increase in the cost of insurance, and greater expense for demurrage, owing to congestion at the ports and deficiency in railway trucks. Lastly, there was the fall in the rate of exchange; the £1 sterling having increased some 30 per cent. These items show what most anxious times there must have been for the management of gas undertakings in Italy. That things were not worse is partly due to the wise stocks of coal which prevision had supplied for 1914 and 1915. Increases in the price of gas and of bye-products could not be made in proportion to the higher costs of material; and such increases were only adopted to modify or obviate the loss, and not with a view of making profit. As it is, the year's working shows a loss of 68,826 lire. At Turin, Bergamo, and Girgenti, there is a reduction in the sale of gas of about 6 per cent. At other places, however, there has been even a slight increase.

In the interests of national defence, the Government has required large and medium-sized works to provide for the erection of apparatus for the extraction of benzol and light oils required for explosives. This means further sacrifice, as only the working costs will be reimbursed. Also the Military Administration has required the supply of tar at below cost price. The report records that care has been taken in every branch of the service to see that expense has been reduced as much as possible, and to adhere to the view that, notwithstanding the condition of the industry, duty calls for co-operation in relieving the wants of the families of the brave clerks and workmen called to the defence of their country.

The long-established sentiment that ties Great Britain and Italy together renders, at such times as these, all the more sincere and marked the great appreciation of, and sympathy with, the efforts and trials of our Italian allies and gas engineering colleagues, on the part of British gas engineers. In the larger sphere, we have cordially welcomed in this country, General Cadorna, and we have now amongst us Baron di San Severino, who is delivering a series of lectures to our British Chambers of Commerce, with a view to strengthening our commercial relations. These efforts we warmly welcome, and look forward with every confidence to their fruition in understanding and prosperity after the Allied victory has been achieved.

Enemy Firms in Neutral Countries.—Included among the additions to the statutory list of firms in neutral countries with whom trading is prohibited, are the following: Argentina and Uruguay—Allgemeine Elektricitäts Gesellschaft; Gasmotorenfabrik Deutz; German Coal Depôt Company, Brazil—Gasmotorenfabrik Deutz. All countries in Central and South America—German Coal Depôt Company, Portugal—Allgemeine Electricitäts Gesellschaft, Oporto. Transactions with persons on the statutory list are prohibited, except in cases where a licence has been granted permitting the transaction.

UTILIZATION OF COAL AND COAL PRODUCTS.

THE TREATMENT OF TAR AT GAS-WORKS.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

At the prevailing prices for material and labour, the strictest attention is necessary in the direction of obtaining the fullest possible value from the whole of the residual products, and a time when tar is realizing, weight for weight, less than half the cost of the coal from which it is produced, is appropriate for a careful review of the whole question relating to the existing outlets for the disposal of this substance.

Leaving out a few of the larger gas undertakings, the practice hitherto has been to get rid of tar at the current market price, even when (as at present) the figure has fallen to a merely nominal amount. All that can be laid to the credit of gas engineers are some isolated endeavours to develop outlets in the direction of asphalt-making or use on roads, the consumption of tar on the works, either as a fuel or as a gas-producing material, and, recently, the adoption of the dehydration process. The low price obtainable for tar, as compared with its intrinsic value, is in no sense a new experience, but has generally been accepted as unavoidable, though the matter might well have many years ago received more attention. If as much ability had been directed to the utilization of tar, on the gas-works, as has been given to ammoniacal liquor, the item of income under this heading would have acquired more important proportions than it has held for many years past. A wide-spread impression has existed to the effect that the distillation of tar was a troublesome and dangerous process; but the experience of those who are working dehydration plants goes to show that this idea has been exaggerated, and that any practical difficulties that may have existed, have been entirely overcome by improvements incidental to modern plant.

The prospects of disposing of pitch—two-thirds of the weight of tar—in the retort-house, has put a new complexion on this question of tar, and has opened up many interesting possibilities as regards its treatment and utilization at the gas-works.

If such a large proportion of the tar can be consumed in the retort-house, one may well question the necessity for paying the cost of carriage of the whole product to the nearest tar distillery, possibly a distance of fifty miles, a trade profit on the same, and the return carriage on the quantity of pitch required. Nor does it strike one as sound business to sell a material and subsequently repurchase it. It is a repetition of the policy that has lately been so strongly condemned in connection with the coal tar dye industry. Gas engineers are accustomed to hear about the effect of their operations as depreciating the value of land and property adjoining the gas-works; but when, by reason of increased business they desire to extend their borders, and are in the market for a few acres of the "depreciated" land, they get a song to a different tune. Similarly, the tar distillers have been loudly proclaiming that the extra profit on benzol is not sufficient to cover the loss on pitch, and that the market quotations are to a large extent of a nominal character. But the general experience at gas-works where the scale of operations does not admit of working-up their own make of tar, and who are consequently applying for a quotation for pitch, to the firm that has been accustomed to take their production, with a view of acting on the advice tendered by the Institution of Gas Engineers over the signature of the President, is that the present market value of pitch is quite as much as that of crude tar, and that current price quotations are, if anything, too low.

The tar distiller is usually extremely keen on the subject of "water" in the tar; but he ignores the fact that the so-called "water" is really ammoniacal liquor of full storage strength—not less than 5° or 6° Twaddel. He bases his quotation on a deduction of 5 per cent. for "water," and stipulates that he is to be credited for any excess above that limit. The fair rate of credit would be, not for the full extent of the water content, but for the difference between the value of tar and the ammoniacal liquor, which is a different thing, and is at present a negligible if not a *minus* quantity. The value of the liquor to the tar distiller is exactly the same as to the gas company, seeing that he also makes sulphate of ammonia, and a distiller taking 1000 tons of tar per annum, secures at the same time some 50 tons of ammoniacal liquor at the bare cost of carriage, exclusive of deductions for excess of water; and the gas undertaking loses the value represented by the profit on 4 to 5 tons of sulphate of ammonia. The receipts for sales of sulphate, as they appear in the gas company's annual accounts, show the net profit after deducting the cost of acid, labour, &c., and the loss by way of "water" in the tar constitutes 2 to 3 per cent. of this amount. Anyone who can obtain liquor on such easy terms need not in the slightest fear the competition of artificial ammonia.

Many gas undertakings are putting down dehydration apparatus with a view of meeting an anticipated large demand for dehydrated tar. The contents of the hydraulic main are at a temperature that is a long way on the road towards that required in the dehydrating still, and why should it be necessary to cool them to atmospheric temperature, run them into a store well, pump them up again, and re-heat, which means consumption of fuel and labour? What is the difficulty connected with working a continuous dehydration process in the vicinity of the hydraulic main, and dealing with the tar as it is formed?

The rational course is to economize heat and labour, avoid loss

of ammonia, and a double carriage on pitch, by means of a continuous process on lines that might be capable of adjustment to admit of producing any quality of distillate desired, and of leaving a residue ranging anywhere between dehydrated tar and hard pitch. The flues leading from the retort-house furnaces to the chimney are capable of supplying sufficient waste heat to carry the distillation to the highest limit. There is nothing more elaborate in the design, or requiring greater care or skill in working, than in the existing sulphate of ammonia or tar dehydrating apparatus, none of which has proved to be beyond the capabilities of the average gas-works employee. And the commercial advantage to the gas company of any scheme is obvious if it would admit of ringing the changes on distillates of various qualities or gravities as desired. If there was a large demand for dehydrated tar, the distillate would consist of light oil. If pitch was the product desired, either for use in the retort-house or for sale, the distillate would be a much heavier oil; and it is not a long step to the separation of the distillate into various qualities by means of fractional condensation. I take it that the "C" process was never recommended as the best practical arrangement for permanent use in connection with the extraction of benzol, but merely as a means of immediately assisting a national emergency. And that in order to obtain anything like the complete extraction of benzol, it is necessary to use a suitable oil as a solvent, and to extend the existing scrubbing and washing apparatus. Following out the lines above indicated, the preparation of a suitable oil, and the subsequent de-benzolization of it, might be conducted at the gas-works.

The existing practice with regard to the disposal of tar is open to the objection that it leaves the producer entirely at the mercy of the buyer. The production cannot be controlled, except by the make of gas; while the storage is limited, with the result that directly there is a diminution in the consumption, or an increase in the production, even to a comparatively small extent, the buyer can fix his own price. With the possibility of using the pitch in the retort-house, and of utilizing the light oils for the carburetting of blue water gas, if they will not realize a reasonable selling price, there are only the intermediate and heavy oils remaining for disposal. And these could, if necessary, be utilized for fuel, without the practical difficulties that have been experienced in connection with the use of crude tar for the purpose, and which are chiefly due to the large proportion of pitch contained in it.

The investigation of every practical method of dealing with tar at the gas-works is the more desirable in view of the new considerations that have been introduced by the war, and the uncertainty of the future position. That a larger demand for benzol will be experienced, may be accepted as a fact; but whether the price will be such as to afford any advantage to the maker is another thing. Extraction plants are now being generally adopted in connection with coke-ovens; and when once established, they are not likely to be abandoned, and there is the possibility that the production from this source alone may be equal to the demand. With past experience in view, it is advisable not to put all the eggs in one basket.

These are very cogent reasons why the use of pitch in the retort-house should be energetically followed up, and receive extended practical investigation. The results, if successful, are likely to prove the first step in the direction of a new era for coal tar, so far as gas undertakings are concerned.

THE "ELECTRICIAN" ELECTRICAL TRADES DIRECTORY.

Difficulties have not been permitted to stand in the way of the due issue of the "Big Blue Book," which it is customary to publish at the end of February—corrected close up to the moment of printing. The work thus named is, of course, the "Electrician" Electrical Trades Directory, the thirty-fourth annual edition of which has been received for review from the "Electrician" Printing and Publishing Company, Limited, of Salisbury Court. Extending, as the book does, to well over two thousand pages, it is not surprising to find that information of a very complete character is given on a wide variety of subjects—but all of close concern to the electrician. In the directory division of the book will, it is claimed, be found the name and address of practically every person engaged in the electrical profession and industry throughout the United Kingdom, together with their telephone numbers and telegraphic addresses; and a separate alphabetically arranged list of telegraphic addresses is included. There are biographies, and a complete obituary for 1915; and manufacturers and contractors seeking business abroad can glean from other sections full and reliable particulars of all the chief officials engaged in the electrical and allied departments of the Governments of the world. Legal and parliamentary matters, patents, fire insurance, and Home Office regulations are adequately dealt with; and the same may be said of the financial aspects of electrical joint-stock enterprise. One can learn of invention and development in connection with things electrical; and last, but not least, there is the full list of the electricity supply undertakings (including the power companies) of the United Kingdom, in the form of compact tables—with other tables devoted to colonial and foreign undertakings of the same character. The published price of the book is 15s. net, postage extra.

THE "CAPTIVE FIRE" SYSTEM FOR FURNACES.

Lecture by Mr. W. R. Twigg, M.I.H.V.E., F.C.S.

Reference was made in the "Journal" for the 14th ult., to a lecture delivered at Bradford the previous week, before an audience connected with the Leeds and Bradford Gas Departments, by Mr. W. R. Twigg, the Technical Manager of the Davis Gas Stove Company, on "Gas-Fired Furnaces and the 'Captive Fire' System of Heating." The following is a report of the lecture, at which Mr. J. H. Barraclough (the Chairman of the Bradford Corporation Gas Committee) presided.

The speaker, in opening, said that, owing to the great extent of the subject with which he had set himself to deal, he would confine his preliminary observations to an earnest plea for a far greater extension of the principle of preferential terms for gas used for industrial operations, as he felt certain that the extension of the use of gas in industry was one of the chief means of economizing our very important and valuable national asset—coal. He felt that the application of gas to industrial operations was quite in its infancy; and that this was the case was most clearly shown by the widely different, and always changing, methods adopted by various manufacturers. He was not there, however, to draw comparisons, or to criticize his competitors, but to explain the methods he had adopted in his position as Technical Manager to the Davis Gas-Stove Company; so he would proceed at once to this the real object of his visit to Bradford.

The subject would be divided into four sub-headings—viz.: A. Low-pressure natural-draught appliances. B. High-pressure gas appliances. C. Air-blast appliances. D. The "captive fire" system.

A.—Low-Pressure Natural-Draught Appliances.

The speaker first illustrated and explained in detail the Davis patent self-intensifying burner (fig. 1), in which a highly aërated mixture is produced, and in which the secondary air supply is preheated. Slides were shown illustrating the application of these

Fig. 1.—Two Types of Self-Intensifying Burners.

burners to single and twin ovens, single and twin muffles, lead-hardening furnaces, filter carbon roasting ovens, tungsten ore roasting furnaces, &c.

Fig. 2.—High-Power Ring-Burner.

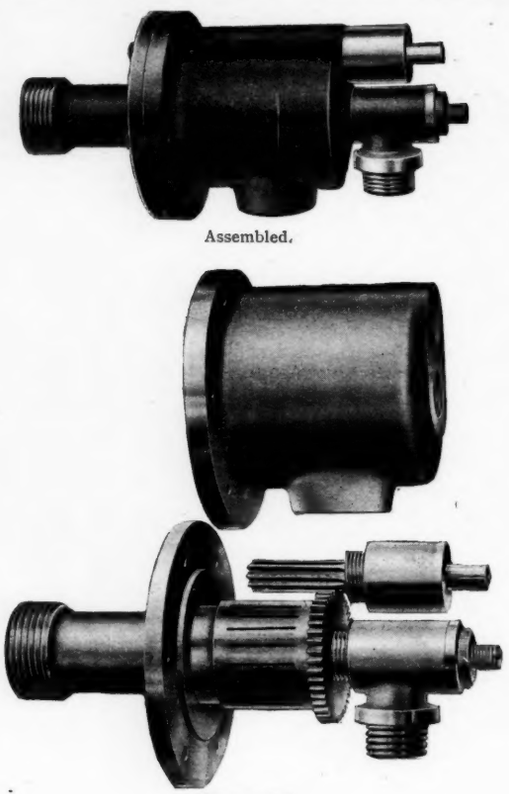
The Davis patent high-power ring-burner was next explained (fig. 2), and its application to soft metal melting furnaces and low-temperature salt-bath furnaces, &c., illustrated by slides.

B.—High-Pressure Gas System.

It was explained that the burners already illustrated and described could be used with great satisfaction with gas at any pressure up to 15 lbs. per square inch; and there were thrown on the screen some interesting colour photographs of these burners consuming gas at pressures varying from 15-10ths water-gauge to 20 lbs. per square inch. The lecturer did not advocate the use of pressure gas except in cases where it was distributed compressed by the local gas undertaking.

C.—Air-Blast System.

The Davis patent air-blast burner (fig. 3) was next illustrated and described. Explaining the burner, the lecturer indicated how the gas is caused to mix with the air in a large number of finely-divided streams, thus promoting an intimate admixture of the gas and air; this being one of the most important features in an air-blast burner. He also explained the method of regulation, and



Assembled.

Dismantled.

Fig. 3.—Air-Blast Burner.

the fine adjustment that was possible. Slides were shown illustrating the application of the burner to crucible furnaces, twin-chamber high-speed steel furnaces, tube-bending furnaces, &c.

Examples of all the burners so far mentioned were exhibited in operation, and their adaptability and regulation demonstrated.

D.—The "Captive Fire" System.

In introducing this system to his hearers, the lecturer wished first to explain the shortcomings and limitations of the appliances already described and illustrated, so that the aims and objects of the "captive fire" system might be clearly defined and free from obscuring side-issues.

(*a*) *Low-Pressure Natural-Draught System.*—With this system, the limits of temperatures economically obtainable are below those very frequently required; and where the furnace is worked close to that limit, difficulties frequently arise, due to uncontrollable fluctuations in gas values and gas pressures. Again, the nature of the atmosphere in a furnace fired on the system can only be controlled to come within fairly wide limits, and is influenced considerably by the chimney pull, which is not constant, and by variations in gas consumption which are not anticipated, or those that are necessary for the satisfactory performance of the work in hand.

(*b*) *High-Pressure Gas System.*—In this system, where gas is not supplied by the local gas undertaking at pressure, the question of compressing is one of importance. Compressors have to be water-jacketed, and are of the reciprocating piston type. These are liable to allow a small, but undesirable, leakage. Metering of compressed gas is also a difficulty where really accurate working records are required, but can be compromised by metering upon the inlet to the compressor. Valves and fittings on the distribution pipes are also likely to give trouble owing to leakage. This system also leaves a lot to be desired in the control that is obtainable of the atmosphere in a furnace. But where gas is supplied at pressure by the local undertaking and metered by them, and where the operations to be performed are suitable for its use, this system is simple both to instal and to run.

(*c*) *Air-Blast System.*—The use of air at pressure in this system permits of the generating of very high temperatures, and the nature of the atmosphere within a furnace may be varied according to requirements. But while these conditions can be provided, uncontrolled variations in the working conditions rob the system of many of the advantages that at first appear to attach themselves to its use. Air at a pressure of from 2 to 5 lbs. per square inch is usually employed; being provided by a rotary type of blower built on the principle of the gas exhauster. The pressure from these machines is liable to fluctuations, which are accentuated by variations in the amount of air being consumed.

Again, the pressure at which gas is supplied is, unfortunately, not constant; and variations in this direction are also accentuated by variations in total consumption. In this system we have, therefore, uncontrolled variation that will be constantly affecting the proportions of the mixture of gas and air used. Again, the relative proportions of gas and air have to be readjusted when a change of temperature necessitates a change in the gas rate; and the skill and care of the operator are the only assurances that this will be correctly carried out. This, unfortunately, cannot be relied upon.

Ideal Conditions.

Having thus reviewed the usual systems, the lecturer pointed out that while the conditions for obtaining the desired results are well known, these conditions are not always obtainable, owing to fluctuations in the uncontrolled conditions of working. He went on to explain that in a furnace working at a high temperature the efficiency would be little affected by variations in gas consumption within reasonable limits—provided that the correct relative proportions of gas and air were at all times, and at all consumptions, retained. On the other hand, the efficiency of such a furnace is quickly deteriorated by slight variations in the relative proportions of gas and air from that at which the highest efficiency is obtained; and the main objective of the "captive fire" system is to provide a means of automatically maintaining a constant relationship between the gas and air supplied to a furnace, irrespective of fluctuations in gas or air supply pressure and alterations of total consumption. It was, however, pointed out that any relative proportion of gas and air can be provided and maintained at any furnace in an installation, or at any burner on any furnace.

Principle of the "Captive Fire" System.

In this system an instrument is introduced into the gas and air feed pipes, the function of which is to reduce at all times the higher pressure until it is exactly equal to, and balanced against, the lower pressure. The apparatus used for this purpose is known as the pressure-balancer. Its function is to ensure that the gas and air shall be supplied at all times to all furnaces at pressures which may vary slightly, but which are always equal, and which therefore results in the relative proportions at each burner remaining constant—even though the total consumed may vary slightly; or, if required for variations of temperature, the total consumption may be varied very considerably.

The Pressure-Balancer.

Fig. 4 shows a sectional diagram of a large pressure-balancer having a 5-inch gas-main and 15-inch air-main; its construction and action being as follows:

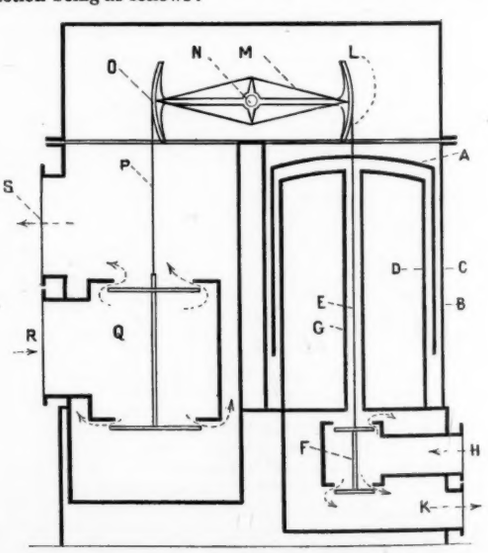


Fig. 4.—Section of Pressure-Balancer.

At A is an inverted bell immersed in oil seals at B contained in the annulus between the concentric tube C D. Suspended beneath the bell A, by means of the flexible cable E, is the double-seated balanced gas-valve F, so arranged that the pressure of the gas, after passing through the valve, is allowed to operate through a pipe at G upon the underside of the bell A. Gas enters at H, passes through the valve, and leaves at K; its pressure now being under control. From the upper surface of the bell another flexible cable L connects to the beam M, which has its fulcrum at N, and connects from O, through the flexible cable P, to the double-seated balanced air-valve Q. Air is introduced at R, passes through the valve Q, and leaves at S, where its pressure is under control. The air pressure, after passing through the valve Q, is allowed to act upon the top of the bell A.

The beam M, the bell A, valves F and Q, and the flexible cables E, L, and P are all carefully balanced at atmospheric pressure, and with the bell dipping into the sealing oil. Care is also taken to ensure that the resistance to movement is reduced to a minimum by using a hardened steel pin-point bearing for the fulcrum of the beam. Under these conditions the equilibrium of the beam is maintained only so long as the pressures on each side of the bell A are equal; but this is irrespective of the actual pressure exerted.

In working, gas at ordinary main pressure is introduced at H, while air, fanned to about 80-10ths water-gauge, is introduced at R. The excessive air pressure upon the upper surface of A causes the bell to descend, and in so doing the gas-valve is fully opened, and the air-valve is gradually closed until the pressure at S is exactly equal to that at K. Should the pressure of the gas

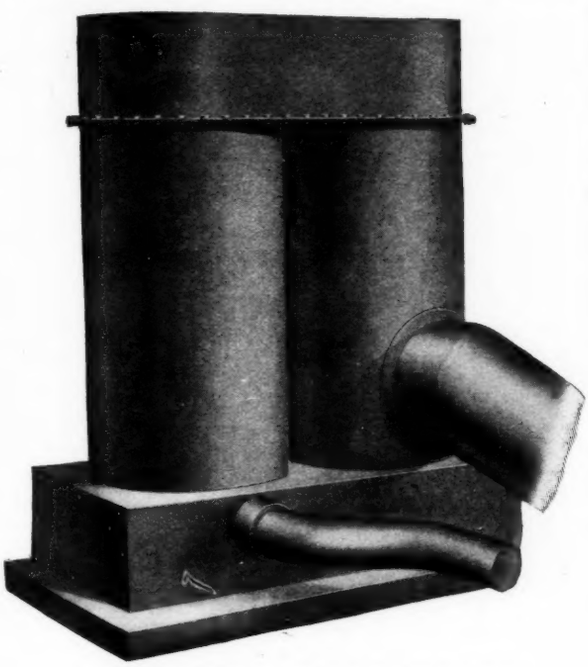


Fig. 5.—Pressure-Balancer on Shell-Heating Installation.

rise slightly, the bell rises, opening the air-valve and allowing the controlled air pressure to rise at an exactly equal amount. If, on the other hand, the gas pressure falls, the air pressure is similarly automatically reduced. Fig. 5 is a photograph of a 5-inch by 15-inch pressure-balancer on a shell billet heating installation.

Adjustable Mixing Valves.

From the pressure-balancer the gas and air are conveyed in separate mains of ample capacity to the various burners on the

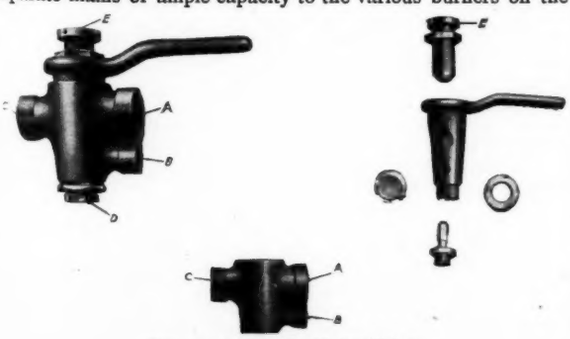


Fig. 6.—Adjustable Mixing Valve.

furnaces to be heated; the mixture of gas and air taking place at each burner, and is brought about and controlled by means of an adjustable regulating valve, as shown in fig. 6.

The air is connected at A and the gas at B; the mixture passing out at C to the burner. The volume of gas burnt is regulated by the adjustable plug D, and the required relative proportion of air is then provided by regulating the adjustable plug F.

A quick, but simple and effective, means of determining when the proportions of gas and air are correct and when a slight excess of air is allowed, is provided in the calibrating instrument shown in fig. 7.

This instrument consists of a sensitive governor into which gas is fed from the pipe connection between C (fig. 6) and the burner —*i.e.*, mixture; the governor reducing the pressure to a constant. At this constant reduced pressure the mixture is fed into an incandescent burner, the luminosity of the mantle being extremely susceptible to even minute changes of the relative proportions of air and gas in the mixture—an excess of air being indicated by a falling of the light intensity and an emptiness in the mantle, while an excess of gas is also accompanied by a lowered light intensity and flame outside the mantle. Even quite slight movements of the

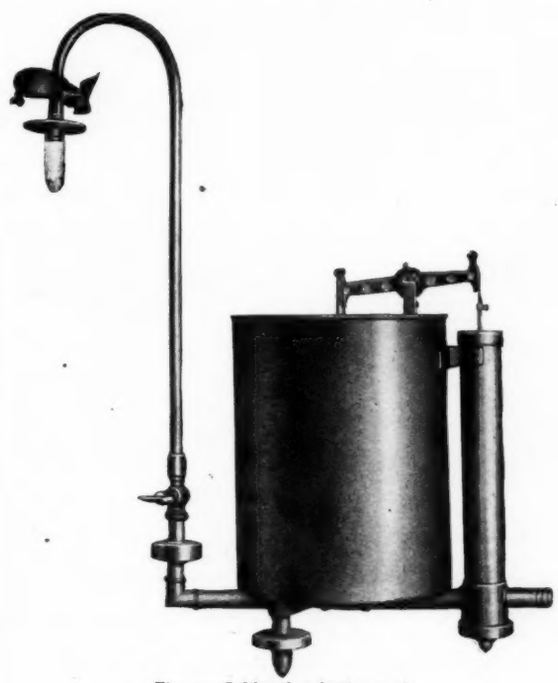


Fig. 7.—Calibrating Instrument.

adjustable plugs on the adjustable mixing valve produce a very noticeable and marked effect upon the light from the mantle.

The "Captive" Fire System and Crucible Heating.

One of the principal applications of this system up to date has been in connection with heating crucible furnaces. The section of a small 20 lb. crucible furnace is shown in fig. 8. A is the adjustable mixing valve, B the burner, C the crucible, surrounded

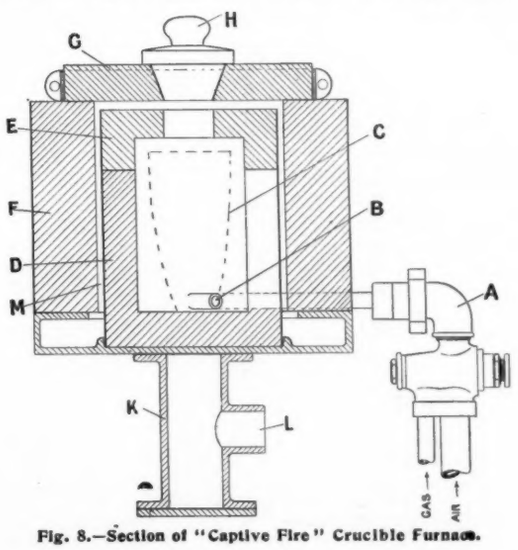


Fig. 8.—Section of "Captive Fire" Crucible Furnace.

by an inner fire-clay jar D, provided with a cover E; the whole being mounted within the fire-clay jacket F, provided with a cover G and inspection plug H. The furnace is mounted upon a standard K, provided with a flue outlet at L; the annular space M

forming a down-cast flue, which practically eliminates heat loss by radiation and conduction from the sides of the furnace. Tests carried out in such a furnace show conclusively that brass can be regularly melted from cold with a consumption of not more than 3 cubic feet of gas per pound of brass melted, and the subsequent melts may be carried out with less than 2 cubic feet per pound of metal melted.

Tests of a Davis high-pressure gas crucible furnace carried out on the working methods of a well-run brass foundry show a consumption of 4·58 cubic feet per pound for the first heat from cold; the best heat of the day taking 2·5 cubic feet, and the average for the day's work of six heats being 3·31 cubic feet per pound. In this test, a 60-lb. crucible was used and charged with two 7-lb ingots; the balance being scrap metal. A similar test of a 60-lb. crucible

Fig. 9.—"Captive Fire" Furnace.

furnace heated by Davis's patent air-blast burners (ingots only being melted) gave 4·34 cubic feet per pound for the first heat, 2·34 cubic feet for the best heat of the day, and an average for the day of 2·92 cubic feet per pound of brass melted.

Fig. 9 shows a 20-lb. "Captive Fire" furnace connected ready for use. 60-lb., 120 lb., and 300-lb. sizes are also made.

Billet Heating by the "Captive Fire" System.

The "Captive Fire" system is particularly applicable to the heating of steel billets for the production of shells of all sizes.

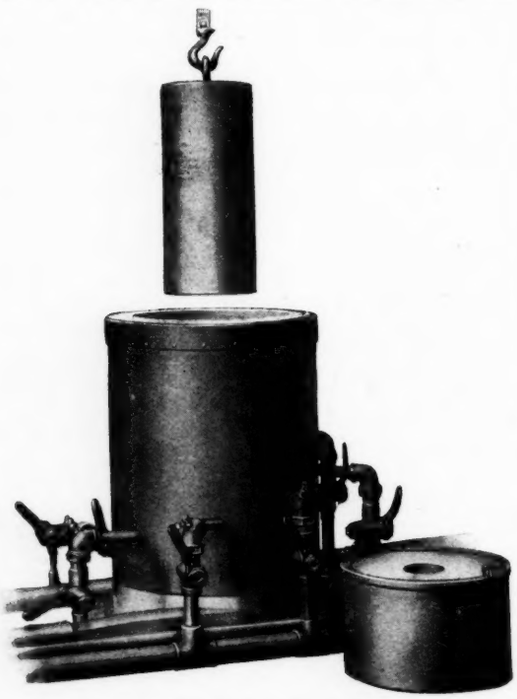


Fig. 10.—Furnace for Heating Billets.

In the case of large shells, a furnace is provided for heating one billet at a time. Such a furnace for heating billets, 29 in. by 12½ in., weighing 1050 lbs. each, is shown in fig. 10. The billet is shown being lowered into position in the furnace-testing bay at the Davis Gas-Stove Company's furnace works at Luton.

This furnace has been tested by the engineers from a very large shell-factory, for whom an installation is now in hand; and in reporting to their chief, it was stated that the gas consumption for heating this billet from cold to a full forging temperature (about 1050° C.) was 1·33 cubic feet of gas per pound of billet heated; that the heating was completed in three hours from start to finish; and that the scale upon the billet when heated was negligible. The vast importance of this latter point will be at once apparent to all acquainted with shell and other forging operations. The construction of these furnaces follows the general lines of the crucible furnace. In the 29 in. by 12½ in. size, eight burners, each fed through a separate adjustable valve, are provided.

For heating 4½-inch and 6-inch billets, a continuous semi-automatic furnace is used. One heating 4½-inch billets is shown in fig. 11. This furnace, 37 feet high, is fed through 28 adjustable regulating valves, and is capable of heating 45 4½-inch shell billets to a full forging temperature per hour. Exact results for heating

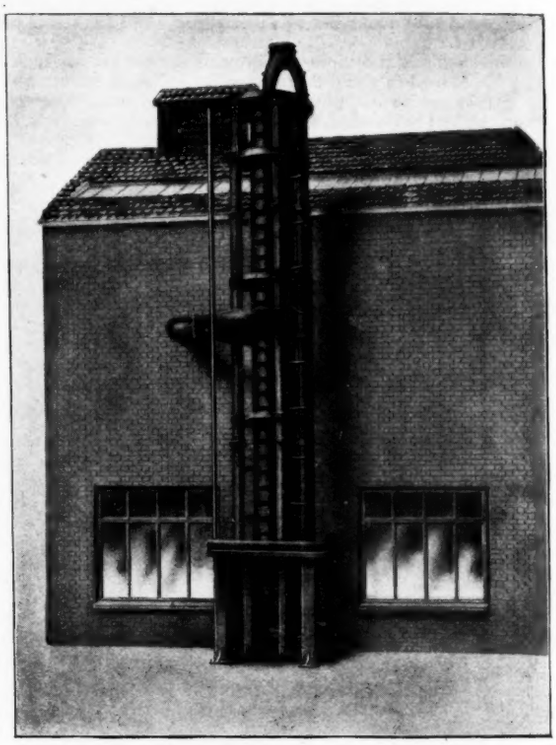


Fig. 11.—Continuous Semi-Automatic Furnace for Billet-Heating.

per ton cannot at the moment be given, as the extended test necessary is not yet completed; but the figure is extremely low, and is in the vicinity of 1 cubic foot per pound of metal melted. This furnace has already been described and illustrated in the Technical Journals; so it will not be dealt with in detail here.

The speaker concluded by throwing on the screen a series of colour photographs of the sight-holes of a furnace taken at various temperatures from 600° to 1200° C., which gave most striking illustrations as to the real relationship between colour and temperature, and the hopelessness of obtaining really useful knowledge on this subject from text-books.

London and Southern District Junior Association.—Members will next Saturday afternoon visit the works of the Tottenham District Light, Heat, and Power Company; and on the 28th inst. there will be an informal meeting at the Westminster Technical Institute, when Mr. J. G. Clark, of the Gas Light and Coke Company, will show a number of lantern slides of technical interest to the members. The annual general business meeting will take place on May 12.

The Staff of British Dyes Limited.—Further arrangements on the scientific side of the business of British Dyes Limited are announced. Dr. M. O. Forster (Chairman of the Technical Committee) and Mr. Joseph Turner (Manager of the works) have accepted seats on the Board; and Dr. J. C. Cain has been appointed Chief Chemist of the new works at present under construction at Dalton, Huddersfield. The Technical Committee now consists of Dr. Forster (Chairman), Dr. Cain, Mr. H. Dean (Chief Chemist at the Turnbridge works), Professor W. H. Perkin (head of the Research Department), Mr. Turner, and Mr. S. A. H. Whetmore (Secretary). Mr. D. R. Mackay has been appointed Secretary and Chief Accountant; and the registered office has been transferred to St. Andrew's Road, Huddersfield.

SOCIETY OF BRITISH GAS INDUSTRIES.

Annual General Meeting.

The Annual General Meeting of the Society was held last Wednesday, at the Trocadero Restaurant, Piccadilly Circus, W. There was a good attendance of members and guests, notwithstanding the difficulties of travelling the previous day, and the disorganization of traffic on the day of the meeting, through the great gale. Before the proceedings commenced, tea was served, through the kindness of the retiring Chairman of Council, Alderman F. Templer Depree, J.P., who subsequently presided at the business meeting until the Chairman-elect, Mr. H. M. Thornton, was called upon to take up the office.

At the business meeting, the minutes of the last annual general meeting and the autumn meeting were confirmed.

Letters of Regret.

The Secretary (Mr. Arthur L. Griffith) announced that letters of regret for non-attendance had been received from the Right Hon. W. M. Hughes, P.C., K.C., Prime Minister of the Commonwealth of Australia, Sir Corbet Woodall, D.Sc., Mr. Dugald Clerk, D.Sc., Professor Arthur Smithells, Professor Harold B. Dixon, Mr. Charles Carpenter, D.Sc., Sir Hallewell Rogers, President of the British Commercial Gas Association, Mr. John Young, President of the Institution of Gas Engineers, Mr. Samuel Glover, Vice-President of the Institution, and Mr. John Bond, Past-President of the Institution, Mr. H. James Yates, Mr. Charles Clare, and several members of the Council of the Institution, and the Presidents and Secretaries of the District Associations. Mr. Thomas Marsh, who has been ill for some time, but is now better, wrote expressing his regret at not being present. He mentioned that he felt his old state of health was gradually returning; and as the business of the Society would in the near future be not only heavy but important, he hoped to be able to render in it such assistance as he was able.

Report of the Central Council.

The annual report of the Central Council was next presented. From it we take the following pragraphs:

Your Council have had under consideration the question of German and Austrian firms associated with the gas industry. Representations having been made to a well-known Member of Parliament, the matter has been brought to the notice of the House of Commons; and the Council are pleased to note that the Government have recently requested all companies registered at Somerset House to furnish full particulars of all shares and debentures held by persons resident in foreign countries. An amended "Trading with the Enemy Act" for dealing with alien firms trading in this country has also been placed on the Statute Book.

The Council have given very careful attention to the importance of trade after the war, and have watched the various movements put forward by the Government, the Chambers of Commerce, and other bodies. There is no doubt that now is the time for British manufacturers to adopt a firm anti-German policy.

Most of our members are much engaged on munition work; and the Council have done all that has been possible to assist them in this important matter. Should any firms get inquiries direct from the War Office, Admiralty, or the local Munitions Committees, and find that any contract obtained is greater than they can undertake, or that there are parts they require which they do not themselves manufacture, the Council hope they will get into touch with members in their district as set out in the lists which have been issued.

A deputation from the Institution of Gas Engineers, the British Commercial Gas Association and the Society waited upon the Explosives Department of the Ministry of Munitions, in October last, in reference to the difficulties which are being experienced all over the country by gas undertakings in need of capital for the extension of their works or the provision of appliances for their consumers. The deputation was received by Sir Sothern Holland on behalf of Lord Moulton. The various points raised were fully and sympathetically discussed by Sir Sothern and other officials of the Department; and it is hoped that the Minister of Munitions will use his influence to remove the present illogical position.

The Joint Committee of members of the Institution of Gas Engineers and our Society who are holding an inquiry into the life of gas-meters has reported that progress has been made with the preliminary work, and the Council hope that satisfactory results will follow the deliberations. They regret to have to record the death of two members of the Committee—Mr. Edward Allen representing the Institution and Mr. Joseph Hepworth representing the Society—both of whom took great interest in the matter. It having been suggested by the Institution that the two vacancies should not be filled up, this has been approved by the Council and the members of the Meter Section.

The Society's prizes in connection with the City and Guilds of London Institute's Examinations in "Gas Engineering" and "Gas Supply" have been awarded, and duly announced in the Technical Press. To encourage students in "Gas-Fitting," the Council have decided to offer the following prizes yearly: First Prize—Honours Grade, Three Guineas. Second Prize—Honours Grade, Two Guineas.

The President of the Society for the coming year will be the Right Hon. H. E. Duke, P.C., K.C., M.P.; and your Council anticipate a very successful year under his guidance.

Sir Alfred Keogh, who is still holding the position of Director-General of the Army Medical Service, has found it impossible to take the chair at the meetings, and to render his valuable advice and assistance, owing to his important official duties. On his retirement from the presidency, the Council feel sure the Society desires to accord him their best thanks for his past services, and trust that, as a Vice-President—an office which he has been pleased to accept—it may long continue to have the benefit of his experience and advice.

The British Commercial Gas Association is continuing its good work; and its advertising propaganda is being pushed forward in spite of these troublous times. The Council hope all members of the Society will show their appreciation by giving it support, as the work being done must be for the benefit of every firm connected with the industry.

The Chairman, in moving the adoption of the report, said he had no startling record to present to the members. They had been planting seed; and the incoming Chairman, he hoped, would reap the harvest. There were several items of work in hand; and he hoped that, during Mr. Thornton's year of office, he would be able to bring them to satisfactory completion. One of the more important questions that had been dealt with was the position of German and Austrian firms. In regard to this matter, they were taking steps to make an addition to the rules which would enable them to deal with it. The question of trade after the war had also been under consideration; and Mr. Thornton's paper was largely directed to this important topic. Reference was also made by the Chairman to the interview with Sir Sothern Holland, as mentioned in the report; and he also alluded to the recent interview with Lord Moulton on the subject of exemptions not only of men employed by gas undertakings, but of men in the employ of the firms connected with the Society. Lord Moulton received the deputation with evident sympathy. He expressed considerable surprise that the starred or badged gas men only included those inside the works, and not those outside. He said he considered a gas undertaking should be in the position of a water undertaking. If the public wanted gas, it was perfectly manifest that it was not only necessary that the manufacture should be maintained, but the distribution as well. The President of the Institution of Gas Engineers (Mr. John Young) stated how, in the case of one city visited during an aid raid, the streets had been torn up, and gas-mains were damaged. Had there not been men available to deal with the trouble, serious fires might have broken out. This had brought home to Lord Moulton as strongly as anything could do that it was not only men inside the works, but men outside who were vital to the interests and safety of the public. He promised that, if the matter were to be carried further, the gas industry should have his full support. [For development, see last week's "Journal," p. 676]. Regarding the successor in the presidency to Sir Alfred Keogh, K.C.B., LL.D., they were fortunate in having secured the Right Hon. H. E. Duke, who was M.P. for Exeter.

Mr. F. J. Gould said, as a member of Section VII., he was particularly pleased that the Council were putting forward the new rule 14A, because there were in the Society members who had been described as enemy firms. There had lately been a natural reluctance on the part of members connected with the Lighting Section to bring forward business items for discussion at sectional meetings; and, because of this feeling, the British members had formed among themselves an inter-Association, so that the position arising out of the war, such as unfair competition by enemy firms in this country, could be fully discussed. He (Mr. Gould) said that one of these firms was described by Mr. Hughes, the Prime Minister of Australia, as German. He said:

> The fact that this firm has thrown over itself the mantle of British nationality is interesting as showing by what means Germans imposed upon the generous toleration of the British people. But it does not in the least affect the true character of the firm, which is controlled by German capital directed by German Directors, for the benefit of German shareholders; and the proper place for the firm is on the Enemy List, from which I do not intend to remove it.

He (Mr. Gould) had much pleasure in seconding the proposal for the adoption of the report, and hoped, if the new rule was agreed to, it would be promptly applied.

The report was unanimously adopted.

Balance-Sheet.

Mr. George Clark, in presenting the balance-sheet, said one unsatisfactory feature of it was that the expenditure was in excess of income. This was easily understood in a society of this kind, which moved in a circumscribed area—that was to say, the members could only reach a certain number; and they had a very fair proportion of the gas firms belonging to the Society. The Society was now well established; and they were getting on to fairly broad working lines. This was evidenced by the amount of money and labour that were now being put into research work. If the Society were going into research, it would be necessary to get more money, and so they would have to increase the subscriptions, and try to get more members into the Society.

Mr. A. P. Main seconded the motion, which was unanimously carried.

Office-Bearers and Central Council.

The Chairman moved, and Mr. Cyril G. Davis seconded, the adoption of the names of gentlemen to serve on the Central Council [see list p. 22].

The Chairman proposed, and Mr. Cyril Davis seconded, the

election of Mr. H. M. Thornton as Chairman of the Central Council.

This having been agreed to, and Mr. THORNTON having acknowledged his election,

Mr. THORNTON moved, and Mr. J. W. BROADHEAD seconded, that Mr. Percy F. Holmes be the Vice-Chairman of the Council. Mr. Broadhead mentioned that it was with peculiar pleasure that he seconded this, as it was at the works with which Mr. Holmes was identified that he (Mr. Broadhead) was first initiated into the gas industry.

Mr. HOLMES having acknowledged the confidence of the members,

On the motion of Mr. SAMUEL CUTLER, JUN., seconded by Mr. R. B. HODGSON, Mr. T. A. Braddock was elected Hon. Treasurer.

Proposed by Mr. H. PERRY, and seconded by Mr. GEORGE HANDS, Mr. Charles Clare was elected Hon. Secretary.

The CHAIRMAN remarked that, in losing Mr. Cyril Davis as Hon. Secretary, the Society was suffering a considerable loss. At the same time, under the rules, fresh blood had to be periodically infused. But although they lost a good man officially, they did not allow him to lose touch with the Society's affairs. Mr. Clare, who was one of the originators of the Society, would make a most painstaking and efficient Hon. Secretary.

Mr. HOLMES moved, and Mr. F. C. TILLEY seconded, the appointment of Alderman F. Templer Depree, J.P., as an elective member of the Council.

This having been agreed to,

Mr. T. E. UPJOHN proposed, and Mr. T. A. BRADDOCK seconded, the re-election of Messrs. W. D. Helps and J. W. Broadhead as elective members of the Council.

On the proposition of Mr. B. B. WALLER, seconded by Mr. H. J. DONKIN, Messrs. Cash, Stone, and Co. were re-elected Auditors of the Society.

With the foregoing elections, the new list of officers will be as follows:

LIST OF OFFICERS.

President:

The Right Hon. H. E. DUKE, P.C., K.C., M.P.

Vice-Presidents:

DUGALD CLERK, D.Sc., F.R.S.
J. H. BALFOUR BROWNE, K.C., D.L.
Professor ARTHUR SMITHELLS, F.R.S.
SIR CORBET WOODALL, D.Sc., M.Inst.C.E.
Professor HAROLD B. DIXON, Ph.D., F.R.S.
Sir ALFRED KEOGH, K.C.B., LL.D.
CHARLES CLARE.

Central Council:

Chairman: H. M. THORNTON, J.P., M.I.Mech.E.
Vice-Chairman: PERCY F. HOLMES.

W. P. GIBBONS	Representing Section	I.
R. J MILBOURNE, A.M.Inst.C.E, F.C.S.	„ „	II.
C. A. GOODALL	„ „	III.
ALFRED COATES	„ „	IV.
THOMAS GLOVER	„ „	V.
A. P. MAIN	„ „	VI.
F. C. TILLEY, M.I.Mech.E. . .	„ „	VII.
T. E. UPJOHN	„ „	VIII.
JOHN BILBIE, M.I.Mech.E. . .	„ „	IX.
ALBERT CLIFF	„ „	X.
GEORGE CLARK	„ „	XI.
R. B. HODGSON, M.I.Mech.E. .	„ „	XII.

Elective Members:

WILLIAM D. HELPS.
J. W. BROADHEAD, M.I.Mech.E.
Alderman F. TEMPLER DEPREE, J.P.

Ex Officio Members:

CHARLES CLARE, *Honorary Secretary.*
T. A. BRADDOCK, *Honorary Treasurer.*

Secretary: ARTHUR L. GRIFFITH, 46, Queen Victoria Street, E.C.

SUBSCRIPTIONS AND FIRMS ASSOCIATED WITH ENEMY COUNTRIES.

Notice had been given of the following alterations of rules:

RULE VI: Instead of reading, ". . . with an annual subscription of two guineas," to read ". . . with an annual subscription of three guineas."

RULE VII.: Instead of reading, "The subscription of two guineas . . ." to read "The subscription of three guineas . . ."

New clause to insert—

RULE XIVA.: "The Central Council shall from time to time scrutinize the roll of the three orders of which the Society consists, and if, in their opinion, any name or names therein appearing ought, for good and sufficient reasons arising out of war or international relations in which Great Britain is involved, to be removed, they shall have power to remove such name or names from the roll accordingly."

Mr. J. W. BROADHEAD, moving that the proposed alterations of the rules should be adopted, said previous speakers had referred to the necessity of the subscriptions being increased, and the question of dealing with alien firms had also been touched upon. In the last three years, they had been spending more money than had been coming in; and if they were going to devote money to research work as they had been doing, and as they had pledged themselves to continue to do at the Council meeting that morning, it was necessary to have increased funds at their back. If the subscription had been increased to five guineas, he should not have objected. But three guineas had been settled upon by the Council.

Mr. THOMAS GLOVER (London) said he was glad to have the opportunity of seconding the resolutions, because he could plead guilty to, in a way, having had something to do with both of them. One of the immediate reasons for an increase in the subscriptions was the money that had been spent on inquiries by the section which he happened to represent. Personally, he looked forward to the time when they would not only increase the subscriptions from two to five or even ten guineas, but, if necessary, to a greater amount, because he was convinced, if they were going to carry on investigations which were of great importance in their practices and to the industry, they would want considerable sums of money at their disposal. With regard to the new rule 14A, this represented, in final form, the alteration the Council had been advised to put before the members. Apparently they could not make it very much stronger. It did not do to pointedly refer to people whom they had in their minds; but he trusted every member of the Society would realize that this rule, if they could enforce it, as he thought they could, would have the effect of dealing with members who ought never to have been admitted to the Society of British Gas Industries.

Mr. JAMES W. GLOVER suggested that, instead of increasing the subscriptions, the number of members should be enlarged by personal canvass by the Chairmen of the Sections.

Mr. GEORGE HANDS agreed that there was something to be said for the view of the Chairmen canvassing for new members. But he pointed out that when Mr. Depree was Chairman of Section VII., he (Mr. Hands) was reponsible for assisting him in getting certain firms to join, so that he thought some care ought to be taken as to who were now invited to become members of the Society.

Mr. CYRIL DAVIS suggested that the Council should draw up a letter setting forth the advantages of the Society, and send it to the firms who were not members.

The CHAIRMAN said that something of the kind was done during the time Mr. Helps was Chairman.

Mr. T. V. MILES said he was quite sure they all felt there was much to be done in the direction of research work; and he was confident there was much more to be done than they ever anticipated before. He was going to propose that the subscription be very much increased. It would be wrong perhaps to fix that day any definite amount; but he felt sure, if the Society hoped to do any real good, they must take up the question of investigation and research, and this had to be paid for. He understood there were 121 firms in the membership; and this would only mean something between £300 and £400 a year.

The CHAIRMAN: We cannot, without giving notice, do anything at present in the way of further increasing the subscriptions.

The motion was carried unanimously.

THE NEW AND THE RETIRING CHAIRMEN.

Mr. H. M. THORNTON then took up his duties as Chairman of the Council, and was received with applause.

The CHAIRMAN said it would be the wish of the members not to allow the opportunity to pass without tendering to their retiring Chairman a very hearty vote of thanks for his services during the past year. Much could be said about Mr. Depree. But he was so well known to the members, and especially to the members of the Council who had served under him, that it was unnecessary to eulogize him. When they elected Mr. Depree to the chair a year ago, they all knew he would fill it with satisfaction; and now that the year had gone, they could congratulate themselves upon having had the foresight to see that the result would be as they anticipated. In the Council Mr. Depree had conducted their proceedings with great dignity and business ability and skill. He had been most diplomatic in his management of awkward situations; and he had safely guided them through many very troublesome moments. The visit paid to the Chairman at Exeter was a happy memory. In short, they had had an excellent Chairman, who had filled the post of honour in the Society with great credit to himself.

Mr. PERCY F. HOLMES, in seconding, said that while they congratulated themselves upon having Mr. Thornton as their new Chairman, at the same time the feeling was tinged with a certain amount of regret that they were losing Mr. Depree.

The motion was carried by acclamation.

Mr. DEPREE, in the course of his reply, said it was extremely difficult to acknowledge the kind things that the proposer and seconder had uttered. He indeed greatly appreciated the fact that so many gentlemen took the trouble to travel such a long distance to support their Chairman on the occasion of their visit to Exeter. It was as great a pleasure to him as he believed it was to those who took part in the visit.

THE INDUSTRIAL OUTLOOK, AND ITS RELATION TO THE GAS INDUSTRY.

At this stage, Mr. J. H. BALFOUR BROWNE, K.C., put in an appearance, and occupied the chair during the reading of the address by the Chairman of the Council, Mr. H. M. Thornton, on "The Industrial Outlook, and its Relation to the Gas Industry." The address and the discussion appear on pp. 24-30.

DINNER AND MUSICAL ENTERTAINMENT.

Shortly afterwards, the members dined together. At the beginning, Sir ALFRED KEOGH, K.C.B., LL.D., presided; but later,

released from parliamentary duties, the Right Hon. H. E. DUKE, P.C., K.C., M.P., the President, attended, and took the chair. The others at the top table, were Mr. Balfour Browne, K.C., Mr. H. M. Thornton (Chairman of Council), Mr. Alderman F. Templer Depree, J.P. (retiring Chairman), and Messrs. F. J. West, A. E. Broadberry (Vice-President of the Institution of Gas Engineers), Percy F. Holmes, S. Y. Shoubridge, W. Doig Gibb, W. R. Herring, William Cash, J. W. Broadhead, W. D. Helps, F. W. Goodenough, Cyril Davis, John A. Ransome, H. C. Head, and W. E. Price (Hon. Secretary of the Institution of Gas Engineers).

After dinner the loyal toast was honoured.

Mr. BALFOUR BROWNE, K.C., said he thought he had really the toast of the evening to propose. It was that of the Army and Navy; and there was no question that the feelings of the nation were strongly enthusiastic in favour of both these arms of the country's service. Some pessimists had complained of the slowness of the war on the part of Great Britain. But most of them were proud even of the slow, deliberate progress that had been made. Many of them had regarded the Fleet as the safeguard of England; but they were now beginning to think that another arm of the service—the air service—might be as important an item in the future as the Fleet upon the sea. He was glad to see with regard to the fight that was going on in the House of Commons—from which their President) Mr. Duke) had just come—the Government had at last seen their way to afford an inquiry as to this service. He was bound to say, in speaking of the Army and Navy, that he was not enthusiastic over a Coalition Government which told them, with regard to the air service, that they were ten years behind their enemies, and without a chance of making up. He (Mr. Balfour Browne) thought there was a chance of making up if they would only put their shoulders to the wheel, and if they could only "ginger" this Government up to a little more activity. He would leave Mr. Duke to reply.

Sir ALFRED KEOGH, the Past-President (whose work at the War Office in connection with the medical service in the war is well known) thanked those present for drinking to the health of the Army and Navy. He had no doubt many of those present had relatives and friends who were fighting with the military forces; and he should like to say that he felt a serious sense of responsibility for the safety and care of those who were wounded or fell ill during the campaign. He was responsible for the medical side of the armies in Mesopotamia, in the Mediterranean, and in France, as well as the arrangements going on in preparation in England. He thought, speaking for his particular branch of the service, that they could, perhaps for the first time in the whole history of the British Army, look people straight in the face, and say they were doing the best possible. He said "for the first time," because unfortunately in the previous campaign the medical service of the Army was not so successful with regard to the prevention of disease. It was only fair to say that during the last ten years the Government had made very adequate preparation for war upon the medical side; and this was the reason why, when the campaign started, they were in a position to assume all responsibilities. It was only fair to say, here and now, that the Minister who was responsible for these preparations was Lord Haldane, and before him the present Lord Midleton (then Mr. Brodrick). He expressed his regret that, owing to the breaking out of the war, he had not been in the position to take a larger part in the work of the Society. He had half prepared a paper to read before the Society, on the "Relations between Science and Industry," of which subject in his civil capacity he had had considerable experience. He had been made to realize in his journeyings about the country that full opportunity had not been taken for bringing science and industry into closer relations with one another. He had seen the faulty relations that had existed between science and industry attributed to the passive resistance of the industries themselves. There might be some truth in this; but it had never been brought home to the academies that they were just as much to blame as the industrial leaders. He felt perfectly certain that the professors in this country must really take a larger interest in the applications of their own science. He had not come across any great master of industry, or great employer of labour in the industries of the country, who was not fully alive to the importance of science to practical work.

The PRESIDENT said that when his friend (Mr. Depree) came to him with an invitation that he should be nominated as President of the Society, he overcame some of his (Mr. Duke's) diffidence by mentioning the names of the two Past-Presidents—his old friend, Mr. Balfour Browne, and his immediate predecessor, Sir Alfred Keogh. It was seen that men of many different occupations were deemed fit for the presidency; and he consoled himself, in face of his own shortcomings, by bearing in mind that neither of his predecessors had found time to disturb the progress of the gas industry. [Laughter.] He would try to follow their good example; and he would tell the members further what he would do if it were humanly possible—he would take care during his presidency to secure the paper from Sir Alfred Keogh to which he had referred. This would probably be better than any contribution he could make. Mr. Balfour Browne said he ought to respond to a challenge he threw out with regard to the shortcomings of the Coalition Government. If his friend spent five days inside a Coalition Cabinet, he would form a very different impression of the tasks they had to face and perform. It was much easier to criticize than it was to help them. So far as he was concerned, in spite of many temptations to take other courses, he had devoted any time he could spare during the existence of the Coalition Government to helping them, and to endeavouring to stimulate their activity—to urge upon them the duty of prescience, organization, system, prevision, and many of the other duties which were preached so often and practised so rarely. Any help they gave the Government would do no harm; and they had no right to give them anything else but help. The country had put them where they were; and they must see that they got a fair chance to perform the tasks imposed upon them. Admiration they had all felt for that noble service of which Sir Alfred Keogh was the head. The miracle of improvising an army of 5 million men in a country which had grudged the existence of an army of 150,000 was only equalled by the miracle which the medical science of the country had achieved in finding under unusual conditions medical attendants sufficient, and even in abundance, for the enormous requirements of their wide battle fronts. Reference was made to our easy-going and happy-go-lucky ways. A country that could produce an army of 5 millions, with a medical service which had responded to the requirements, and in substance was equal to these requirements to-day, and foresaw the anticipated requirements, had a good deal to say for itself when it met its enemy in the gate. He congratulated the Society, if he might venture to do it, upon the presence on the list of its Presidents of Sir Alfred Keogh, who was at the head of their great military medical service. Sir Alfred had alluded to the new time which was ahead. There was no question about the new time. They knew they could only accept one issue of this conflict. There was a new time for the whole civilized world ahead; and in the industries of this country, it was the part of those who had guidance in their hands and responsibility on their shoulders to look forward to that new time. They preached prevision by government; let them practise it themselves. This country and its industries, their Allies and their industries, the Empire and its industries, the coalesced industries of the truly civilized world had to fight their way into the new time ahead. It was an enormous responsibility upon the leaders of industry. The battle of this time was not going to stop with the declaration of peace. It was not going to stop with the final subjugation of the forces of barbarism. The real battle was going to begin after they had won the battle; after the barbarian was forced back to his proper place.

Mr. H. M. THORNTON (Chairman of Council) in proposing "Our Visitors," spoke of the assistance the gas industry had rendered, and was rendering, in the prosecution of the war. He was sorry that Mr. John Young, the President of the Institution of Gas Engineers, could not be present; but they were glad that Mr. Broadberry, one of the Vice-Presidents, had been able to be with them that evening. With the toast he coupled his name.

Mr. BROADBERRY, in his reply, expressed the appreciation of all the visitors of the privilege of being present on such an occasion as this. He noted that in his address that afternoon, Mr. Thornton laid stress upon the supply of cheap gas; and pointed to a low capital cost as being one of the factors in the supply of cheap gas. The matter of cheap gas was largely in the hands of the members of the Society. If they would only supply gas undertakings with apparatus for nothing, they would keep capital down, and the undertakings would then be able to supply very cheap gas, notwithstanding the high price of raw materials. [Laughter.]

The rest of the evening was occupied with a musical programme.

Economy in the Use of Coal.

In the course of an appeal to the public to exercise the greatest economy possible in the use of fuel at the present time, the Board of Trade point out that the demand of the war industries is constantly increasing. At the same time, coal provides one-tenth of the total value of our exports; and the maintenance of the export trade was never of more importance than is the case now. Out of a total output of coal last year of 253 million tons, 43½ million tons were exported. Of this quantity, 23 million tons went to the Allies, and 17 millions to neutrals. In the latter part of the year, however, the quantity exported showed a falling off; and in the first two months of this year there was a decline of a million tons. The Board express the view that, "inasmuch as inland prices have been artificially kept relatively low by legislation and voluntary arrangements," there is "a special obligation on individuals to co-operate with the Government and reduce in every possible way their consumption of coal, whether in the form of fuel, light, or transport services." It is remarked that a reduction of 10 per cent. in the household consumption would permit of the export in a year of some 3 million tons more. The Board proceed to draw attention to the fact that at the present time coal in Europe is to a considerable extent a British monopoly, and they add, "British coal power is an asset that must be jealously preserved, and economy in fuel should be regarded as a necessary part of the national effort."

Coal-Tar Pitch in Coke-Ovens.—It is reported by the "Iron and Coal Trades Review" that the Manager of the coke-oven plant at the Talk o' th' Hill Colliery has carried out tests (which agree with those obtained at the Birchenwood plant) in which coke and pitch have been carbonized according to ordinary coke-oven practice. Mixtures in proportions varying from 2 to 6 per cent. of pitch were tried; but a considerable increase in the percentage of tar was noticed at the higher percentages, owing to some of the pitch being kept in circulation. With a 3 per cent. mixture, no trouble was experienced, but, on the contrary, the quality of the coke was improved—being denser, brighter, and harder, with the ash and sulphur contents decreased; and the percentage of breeze was reduced. There was no difficulty in working the mixture in the ovens; the pitch being ground up and mixed with the slack at the elevator-hopper. The oven charge was worked off in the usual time; and the coke pushed easily. The yield of coke from the pitch was from 55 to 60 per cent. The balance was made up approximately as follows: Tar, 23 per cent.; gas, 14 per cent.; loss, 3 per cent. It may, says our contemporary, be stated with confidence that the results indicated will be obtained; and the process may therefore be recommended to the notice of collieries working bye-product coke-ovens, particularly those having their own tar-distillation plants. Since November last, the Manager of the Talk o' th' Hill coking plant has used 500 tons of pitch; and he maintains that a plant carbonizing 2000 tons of coal per week, and producing 50 tons of pitch, would, by the application of the process suggested, use up to 60 tons per week.

THE INDUSTRIAL OUTLOOK AND ITS RELATION TO THE GAS INDUSTRY.

By H. M. Thornton, J.P., M.Inst.M.E.

[An Address delivered before the Society of British Gas Industries, March 29.]

For General Report of the Proceedings, see p. 21-23.

Our thoughts this afternoon—strive as we may to concentrate them—are, I feel sure, straying from this comfortable hall, with its congenial company, to far different scenes, where our brothers, our sons, our kinsmen, and many of our employees are watching, guarding against, and fighting an implacable and bitter enemy, whose deepest hate and strongest endeavours are directed against the Empire to which we are proud to own allegiance.

Yet, with these tremendous events occurring, and with the issue still undecided, no apology is needed for meeting in our accustomed manner. Moreover, I feel no misgiving in asking you to direct your attention to the subject of "The Industrial Outlook, and its Relation to the Gas Industry;" for it is the duty of all who, by reason of age, health, or responsibilities, are denied part or lot in the military struggle to take counsel together, on such occasions as this, to see how far we can prepare—nationally and industrially—to meet the strenuous and critical years that lie immediately ahead. Where shall we stand at the end of the War? Our progress in the past has been phenomenal. Will it be materially and vitally interrupted, or may we look forward not only to a resumption, but to an acceleration of our trade, our commerce, and our national well-being? England must continue to be not only worth dying for, but worth living in.

The National Position.

Let us for a moment glance at our present position, and try to realize the almost incredible strength of the Empire. The Accession of James I. (1603) may fitly be taken as the starting-point of our early colonization, when the first permanent settlement took place in America. Since then, in almost unbroken progress—by colonization, by conquest, by discovery, by emigration, and by peaceful expansion—we have built up an Empire with an area of thirteen million square miles, and taken over in friendly co-operation a quarter of the population of the world. Nearly 50 per cent. of the world's shipping flies the British Flag. Our scientists, manufacturers, and engineers have ever been the foremost in the world. Most of the basic inventions are ours. Numbers of the great business builders have been trained by us. Many of the greatest engineering enterprises—the wonder and the admiration of the world—have been conceived by our countrymen. We have much to this country's credit which stirs our pride. One of the most inspiring and instructive addresses delivered during this time of war was in November last by Mr. Dugald Clerk (first President of this Society) to the Royal Society of Arts, on "English and German Methods Contrasted." I can recommend no finer antidote to the pessimism of some sections of our Press than this review by a master mind of the principal industries and fundamental inventions in the world's recent history, in which British enterprise and scientific ability have so markedly taken supreme position. Mr. Clerk's statements have been strongly confirmed within the last few weeks by no less an authority than Sir Robert Hadfield, who stated: "In my own line of research—the science of metallurgy—I say unhesitatingly that Germany's advance has been based almost entirely on British, French, and American inventions and practice. After long experience, I am convinced that we have never been indebted to Germany for a single basic principle."

In the world of finance, our status is undisputed. We have accumulated a wealth which, viewed in the aggregate, seems incredible. We have, besides developing the industrial possibilities of our own island, advanced the preponderate share of the money required for the development of civilizations other than our own. The United States is our debtor to the extent of six hundred millions sterling. We have lent six hundred and fifty million pounds to the South American Republics. We have invested in India and the other British overseas Dominions the stupendous sum of one thousand nine hundred millions. Analyzing these almost unrealizable figures further, our investments outside Great Britain include:

Railroads	£2,000,000,000
Mining	275,000,000
Tramways	84,000,000
Telegraphs and telephones	44,000,000
Oil	43,000,000
Rubber	70,000,000
Gas, water, and electricity	62,000,000
Tea and coffee plantations	30,000,000
Nitrate properties	12,000,000
Land and miscellaneous industries	450,000,000

London has become the clearing-house of the world, and the centre of its financial activities. Is there a railroad to be built in South America, a township to be developed in Canada, rubber to be planted in Africa or tea in India, is there a river to be dammed or bridged in the uttermost parts of the earth—then to London comes the appeal for the capital.

We are justly proud—though, happily, we are not prone to boast—of our pre-eminent position; and let it be said we have rarely, if ever, misused our power. The world's debt to the British Empire cannot be measured in terms of money. We have given much, we have given freely, for the general benefit of the human race. We have brought into productivity and fertility many of the waste places of the earth; we have linked continent with continent, and sea with sea; we have developed unknown and unexplored possibilities of trade; and, most important of all, have pointed to a nobler ideal and a more solid basis of commercial integrity, winning slowly and quietly the respect and confidence of the other nations of the world.

What of the future? Faced with a colossal debt, and its consequent heavy burden of interest and repayments, need we be apprehensive? Let me quote the opinion of Sir George Paish:

"At the end of the war, Great Britain will stand just about where she stood at the beginning. She will have sold a great many of her foreign securities; but, on the other hand, she will have bought others from her allies, colonies, and customers; and, on balance, neither her home nor her foreign wealth is likely to be appreciably reduced. What she will have lost will be her new savings. This loss already amounts to about £600,000,000; and, if the war lasts another year, her loss will reach £1,000,000,000 in comparison with what her wealth would have been but for the war. Of course, she will have created a great debt. Already the debt, including the pre-war debt, is about £2,200,000,000; and the debt charge and current Government expenses, including normal military and naval expenses, are some £300,000,000. But it must be remembered that about £100,000,000 of this is interest which accrues to British investors, and that a large part of this interest will still be available for new capital purposes. In spite of the new debt, or perhaps because of it, we may confidently expect that the nation after the war will have as much new capital for investment as before the war. One must also recollect that the whole nation is learning to work more efficiently and skilfully. With some 3,500,000 men with the Colours and in the Navy, the productive power of the nation has not been appreciably reduced, if it has been reduced at all, taking into account the splendid work now being performed by the makers of munitions. Therefore when the armies return from a victorious war, it is evident that the productive power of the nation will be greater than ever. Consequently, it is not unreasonable to expect that the nation's power to find new capital will be fully maintained.

"After the war is over, the British people should be able, by reason of their greater efficiency, to provide a still larger amount of capital from year to year for the interest of their own and the world's productive power; and, in the course of a relatively few years, they will probably make good the very heavy losses they are now incurring. If we all perform to the best of our ability, the work that falls on us, and look forward with high hopes to an ever brighter and greater future, nothing can stop the progress of our nation."

On this note of high optimism, Sir George Paish concludes a remarkable and confident survey of the economic strength of Great Britain. Sir Edward Holden, the Chairman of the London, City, and Midland Bank, takes an equally bright view of the future. He said recently, "If we concentrate our attention more upon the possibilities of home production, instead of decreasing our labour output as we have done for so many years, the present difficult times through which we are passing will prove to be merely an interlude, the forerunner of even more prosperous times than the country has ever enjoyed in the past."

There is another important consideration to be taken into account. It is impossible that our relations with Germany, and perhaps even with Austria, can in our generation assume the old character; but, on the other hand, there are forces working for a closer and more intimate association with our Colonies and our Allies. United and interdependent in war, the resumption of peace should but emphasize and consolidate these conditions. Circumstances everywhere will be changed; and the organism which does not adapt itself to its environment will cease to exist.

It is, however, evident that, to meet our obligations without unduly sacrificing our average standard of living, will require the best efforts of which we are capable. Among many other things, the State will have to take a more active interest in our industries, and energetically render support to all sound endeavours to secure a larger proportion of foreign trade. The resources of our Empire will have to be the subject of searching investigation; and we must make our Allies in war to-day our Allies in trade in the future. We must see that our productive power is of larger volume and greater value than before; and our educational system must receive greater attention than hitherto.

State Assistance in Industry.

Dealing in as few words as possible with these subjects, let us consider first that of State assistance to the trading community. This proposal has been extensively canvassed during recent months, and should, I feel, commend itself to our support. I am, however, not enamoured with the proposal to create a new Ministry of Industry and Commerce independent of the Board of Trade. We do not want, if we can help it, to multiply Ministers and so make fresh opportunities for those inter-departmental jealousies, and cross-purpose workings of which we have seen so much in the past, and as a result of which the interests of the nation are neglected. In the multitude of Ministers, there is weakness. I would prefer to see, instead, an enlargement of the Commercial

Branch of the Board of Trade, which has done much valuable work during the war—more, indeed, both in quantity and in value, than most people realize, for want of knowledge necessarily withheld. I would like to see the branch extended so as to be an Industrial and Commercial Department of the Board, and strengthened by being put under the control of a Council of a few —a very few—men of wide business experience and proved business capacity, with adequate salaries, and required on their appointment to relinquish all business connections. It should also be an indispensable condition that no one should be eligible for appointment to any grade of the staff who had not, prior to passing a stiff entrance examination, had at least five years' commercial or industrial employment.

While under our constitution, broad lines of international commercial policy must be laid down, and the expenditure of every department must be controlled by the Government of the day, so that the President of the Board of Trade must be a member of the Cabinet, it is imperative that the administration of the Department of Industry and Commerce should be kept free from party influences, and be carried on by business men on business lines, and with the greatest possible degree of continuity in policy compatible with progress. Continuity of policy is a prime essential of such a Department—indeed, the basis of all successful endeavours is continuity. No one attempts to read by the light of a rocket, however momentarily brilliant. No lasting success can ever be achieved without continuous effort. The permanent head of the Department of Industry and Commerce should be entrusted with large executive powers, be as unfettered as possible in his exercise of them, and be chosen exclusively on the ground of his experience of business and world-wide knowledge of industrial requirements and possibilities. The position must be made attractive and valuable, so as to ensure the services of the very best man available; and his appointment should be made in consultation with the Associated Chambers of Commerce, and other representative bodies in industry.

Then, well-paid representatives should be appointed in every part of the world, replacing, or co-operating with, the Consular Service of to-day. The duties of such representatives should be to devote their whole time to watching British commercial interests, and to fostering British trade. They should be required to search for every outlet for our productions, to suggest possible business for British goods, and to initiate inquiries as to probable new commodities suitable for British manufacture. Periodically each should collect, for exhibition in this country, samples of goods purchased by the country to which he is appointed, which hitherto have been bought from other nations, together with full and complete information concerning quantities required, probable prices, freights, duties, and other useful information.

In short, we want a State Business Building Department, with the time, ability, and power to organize to the full the maximum output and export of our various industries. A Department such as suggested would have before it a vista of possibilities of national advantage such as no other Department of State could rival. The future greatness, prosperity, and financial status of our country are rooted in its industries; and other nations will energetically and increasingly compete with us for supremacy. Therefore, to survey the extensive lucrative field of the world, to direct the employment of capital, to study the supplies of materials, and to apply the energies of labour, here truly is a task worthy of the best brains of our great Empire.

Neglected Industrial Resources.

Dealing now for a moment with our Empire's industrial resources, a recent article, by a prominent economist, pointed to our very serious neglect in this direction. He takes, as an example, the important metal, nickel—an essential military metal, which, combined with copper, forms the outer casing of the modern rifle bullet. He says:

"One of the best nickel supplies in the world is situate in the Dominion of Canada. One would think, therefore, that at least as far as nickel was concerned the British Empire in war would be in particularly good case. The United Kingdom, which in recent years has contrived to save some £200,000,000 a year for investment outside its waters, could apparently find neither capital nor enterprise to develop the nickel of Canada. The nickel ore has been exported from Canada to the United States, because the Dominion herself has no nickel refineries. In America, the nickel is dealt with by a foreign corporation. Consequently, Britain finds herself at war and requiring nickel, but unable to control the nickel of its own Empire."

The same writer then takes what he terms "an even more extraordinary case"—that of zinc.

"The United Kingdom has very little native zinc, only producing from its own ores 6000 tons per annum. It has allowed the monopoly of the European zinc trade to get into the hands of Germany. It is true that Germany possesses a good deal of native zinc, but Germany was not content with that. She looked about in the British Empire, and found a splendid supply of zinc in Australia. The Broken Hill Silver-Lead Mines accumulated over many years an enormous quantity of zinc residues. The Germans knew how to utilize these; but we did not. And they made a contract with the Broken Hill Mines to take up all their zinc concentrates until the year 1921. When the war began, the German contract, of course, went into the melting-pot, but that did not free us to use the Australian zinc, because we had not big works capable of using it. Therefore, it had to go to the United States —another foreign country—in order that that foreign country might smelt the zinc, and supply us with what we sorely needed."

There is another case that strikes very closely home to us all. For its lighting, the gas industry is dependent upon nitrate of thorium extracted from monazite sands. Time was when deposits of monazite sands of any extent were only known in places outside our Empire. Eventually, enormous deposits were found at Travancore in India. A "British" Company (I put the word "British" in quotation marks) was formed, as required by the concession, to utilize these sands; but (not in accordance with the terms of the concession) a large part of the capital was held, with indirect representation on the Board, by a Company owning electric lamp patents in Germany. The irony of the situation! With that Company a contract was entered into by the "British" Company (I again quote the word "British") under which the German Company took the good thorium-bearing monazite sands of Travancore. Thus it comes about that, since then until the war broke out, incandescent mantles and nitrate of thorium produced from the Travancore sands of India—part of our Empire —have been supplied *viâ* Germany to this country. By the energetic action taken in certain quarters in the gas industry since the war started, the Foreign Office has stamped out the German control, and ensured that any demand in this country for the Travancore sands shall be satisfied direct. When the deposits were found, no opportunity was given this country to put down plant for the production of the thorium nitrate; but, under the new order of things, plant has now been constructed for the purpose.

Take one more illustration—paper. In a recent address before the Royal Society of Arts, Mr. F. C. Phillips, M.S.C.I., made the statement that, "within a comparatively short time, providing the capital were available, Canada could unquestionably produce enough wood pulp for the paper-making requirements of the whole world."

These are only examples; but they indicate that we have too little information as to the potentialities of our own overseas Dominions. There has not been an adequate reciprocal interchange of knowledge. Had there been, it would not only have formed the basis of a closer and more vital community of interests, but would have made us, at the present time, within the Empire, largely self-supporting. We have one-fifth of the world's area to draw upon; and we have the inestimable advantage of being able to make common plans for the mutual advantage of the whole. Surely, here we have at once a tremendous responsibility and a tremendous opportunity.

Industrial Productivity—Position of the Worker.

I have earlier in the address endeavoured to show that, serious as our obligations must be after the war, yet capital will be available for expansion at home and for foreign development. Subject to an energetic and serious reorganization of our Imperial and industrial life, the future therefore need not dismay us. This brings me to a very important branch of the subject—industrial productivity. The need for improved relations between Capital and Labour is very clear. The barrier which exists has often prevented proper co-ordination of interests; and the present protective and restrictive laws imposed by trade unions have had the effect of seriously limiting the nation's manufacturing productivity. When we resume the trade war (or rather it would be preferable to pave the way before then), employers, on the one hand, must be ready to discuss the situation frankly, and to make any reasonable sacrifice to remove the suspicions on which these restrictions are based. The trade unions, on the other hand, with a fuller education, must realize the serious weight on their country's future commercial prosperity which their policy has imposed. Both capital and labour are the losers by the prevailing lack of understanding. The master loses by his energies being occupied with, and by their useful application being contracted by, disputes, by his plans being frustrated by the fear of strikes, and consequent loss of profit, good-will, and possibly capital. The workman loses chiefly by limiting his value; and he must be enabled to realize that his wage would increase if, by the value of the work he did, he was able in any way to cheapen the cost of production. The fear that too much output per man will create a shortage of work cannot, even by the poorest intellect, be seriously believed. With a population of only 45 millions, even if we had only our own Empire for our markets, there should never be any possibility of such a position.

Physical Strength of the Worker.

The manufacturing productivity of a nation is the sum of the manufacturing productivity of the individual units. Therefore the physical strength and endurance of the worker are material factors in the productivity of the community. It is of the highest importance to the nation, as well as to the individual, that consideration should be given to such reforms as physical comfort and healthy conditions for employees, including good lighting, heating, and ventilation. Proper housing conditions, cheap and speedy means of conveyance of employees to and from works or factory, and the provision of industrial canteens supplying meals at moderate prices, are all matters which cannot be neglected if the workers' efficiency is to be maintained at its highest level. The necessity of these aids to industry has been emphasized by the present industrial activity of the country; and the Ministry of Munitions has welcomed and encouraged all attempts that have been made in the directions indicated, which have proved so beneficial to the workers, and to the output of munitions of all kinds.

Education and Productivity.

In touching very briefly on the question of labour, we must not

forget that, while trying to eliminate the difficulties of the present, a real and far-reaching effort must be made in connection with education. Much remains to be done in this direction; and the problem requires to be earnestly faced. Our future depends in no small degree on our educational policy. Enthusiasm is impossible without knowledge; and lack of enthusiasm has been responsible for many of the shortcomings of British workers. Slackness, narrow-mindedness, inability to realize great issues, and *lack of perception* are largely due to the fact that opportunity has not been provided to secure the knowledge that will enable the true proportions of a man's position as a unit in the nation's industry to be realized.

Haphazard methods, providing but a smattering of theory, the endeavour to inculcate knowledge in evening classes only when the youth is exhausted by a day's work, must give place to properly systematized education, with opportunities for training in the day time. It is of great importance that we should encourage and support our Universities and Technical Schools, to enable them to provide for the industries of this country a large number of well-trained scientific men. We are glad that as a Society we assisted in founding the Livesey Chair at the Leeds University, and that we have been able to provide annual prizes for successful candidates in the "Gas Engineering" and "Gas Supply" examinations of the City and Guilds of London Institute. I am sure as our funds permit we can find no better and more profitable form of investment than in educational encouragement. Our Retiring President (Sir Alfred Keogh), who has done such valuable work in his capacity as Rector of the Imperial College of Science and Technology, in a recent letter published in the "Daily Telegraph," said:

"There is no doubt that institutions now existing in this country can provide satisfactory training in science for men whose careers are to be industrial. That has been proved in numerous cases where selected men have been recommended for industrial positions on the completion of their scientific training, with great advantage both to the industries and the men concerned. More students of the right kind are wanted for a longer period of training, and a closer connection between institutions and those concerned with industry than at present holds. The latter is probably the cure for the former. So soon as manufacturers recognize that scientifically trained men can be of use to them, the difficulty of securing a sufficiency of men for training will disappear, and the consequent improvement in the prospects of such men will lead them to devote a longer period to preparation for their careers. Several collegiate institutions are fully aware that their primary duty is the training of men for industrial purposes, and that their research departments should be placed at the disposal of industrial concerns. It is for the industrial leaders to interest themselves in institutions which have been established for their benefit."

The scheme of industrial research scholarships now in operation in the Universities of Pittsburg and Kansas is decidedly interesting. It may be summarized as follows: Men who have graduated with distinction and exhibited capacity for original research are nominated by the University as Research Fellows. Manufacturers who are concerned with scientific processes are invited to state to the University, in strict confidence and in detail, certain particular scientific difficulties or problems in their work which they wish solved. They then enter into a contract with the University to pay for a defined time the stipend of a Research Fellow and certain fees, and to give a bonus or royalty to the investigator if the problem is satisfactorily solved. The Fellow, on his part, binds himself by contract to secrecy, undertakes to apply for patents, if required, on behalf of his employers, and enters into certain other covenants. In this manner, the interests of all parties are united.

The manufacturer has placed at his command the resources of the university laboratories and libraries; and his expenditure is strictly limited. The investigator has an inducement to do his best, and a stimulus to diligence and preservation of reputation. The University is benefited, and, in many cases, as an indirect outcome of the solution of commercial problems, valuable contributions to pure scientific knowledge are obtained. The Research Fellows gradually gain experience in industrial research, which makes their work progressively valuable.

The Future and the Equipment of the Gas Industry.

We have now considered our great national strength, pointed to the recuperative powers we possess, and noticed some of the directions in which improvements in national organization may be beneficial. What of the future of our own industry? How is it equipped to meet the future? Like many other industries, and possibly to a larger extent than some, our prosperity is linked indissolubly with the general prosperity of the community. There has been evidence of this in the work associated with the large and pressing demand for munitions. It is unlikely that manufacturers, having learned, owing to the entirely unprecedented circumstances, of the economy and efficiency of gas for industrial processes, power, light, &c., will, on the return of peace, forget these advantages. The lesson will not be lost; and the strong position attained by gas in war time should form a sound basis for the future. This all means greater demand for gas-producing plant and gas-consuming appliances.

In passing, may I remind you, in a few sentences, of the part which gas is taking in the production of war-time necessaries. It is an absorbing story. Benzol, toluol, and dyes are being produced from and through the manufacture of gas. Gas-furnaces have been applied for the heat-treatment of shells, and the making of guns, rifles, aeroplane parts, motor gear parts, and high-speed and other tools. Gas-engines have been required for power. The new factories and the many extensions of the old ones have needed gas lighting and heating. There has been, too, the heating of hospitals and the equipment of their kitchens; and the provision of canteens for works, hostels, "Y.M.C.A." huts, &c. In these and many other ways gas has, through the war, made extended entry into the service of the nation. It is a record of which we as an industry are proud.

These activities, and the consequent increased familiarity with the benefits of gas appliances, cannot, as I have said, but bear fruit in future years, and I believe the gas industry has never before been in a better position—subject, of course, to normal conditions—to meet efficiently all the demands that may be made upon it. We are glad to feel that the firms in this Society may legitimately claim to have contributed largely towards securing this efficiency. The high level attained to-day by the producing plant and processes of gas-works has never before been reached; and, in fact, we know of no utilization of coal, other than that which obtains in the gas-works, in which there is so little waste and such profitable recovery of the constituents of the raw material. Not only are the gas-manufacturing processes at a high state of efficiency, but the appliances for the utilization of gas have never before reached such a satisfactory standard; so that, although we have no reason to think, or disposition to imagine, that we have attained the limit of efficiency in either the manufacture or the utilization of gas, the industry is to-day well equipped for rendering service in the national trade development to which we are looking forward.

And we are well organized. We have the Institution of Gas Engineers, with the affiliated District Associations and Commercial Sections, the British Commercial Gas Association, the Sulphate of Ammonia Association, the London Coke Sales Committee, and last—and may I say "but not least?"—our own Society. Each of these is watching and developing the interests of the gas industry. We gladly acknowledge their good work, and particularly, perhaps, that of the B.C.G.A. and our own Society in promoting a closer co-operation between the gas undertakings and the manufacturers of gas plant and appliances. We have much more in common than appears superficially. Our interests are in many respects interdependent and parallel; and nothing but good can follow more intimate relationship and a freer interchange of ideas, with each side retaining all reasonable freedom of action where interests diverge, as they necessarily must beyond a certain point. However, we believe ourselves to be, as a whole, an industry efficient, financially sound, fundamentally valuable to the nation, with good organization and a helpful spirit of co-operation existing betweeen all parts.

The Price of Gas.

Before concluding, there are one or two aspects of the future towhich you will expect me to allude. For instance, one of the most important considerations for the coming years is the supply of gas at a cheap price. This will be a great, if not the determining, factor in the future expansion of gas supply. Cheap is a relative term; and here we have to consider it in association with coal, electricity, and possibly other competing commodities. Cheap gas is a product of more than the cost of raw materials. It is unlikely that coal or oil will for many years descend to the low level of prices that have obtained in years not distantly removed from now; but, on the other hand, the high level of gas-manufacturing efficiency, which I have before mentioned, is a great, though perhaps only partial, compensating advantage.

One of the factors beyond the cost of raw materials is the cost of capital. The gas industry has been fortunate in the past in regard to the raising of capital, both in respect of statutory powers and its reputation as a sound investment. But the standard of return on capital has been generally raised of late for obvious reasons. This means, naturally, the dearer the capital, the higher the capital charges on the gas per 1000 cubic feet. The increase, however, has not such a serious effect as when 10,000 cubic feet per ton of coal was the maximum production. Once again improvement in efficiency steps in to help to redress the position; and 12,000 to 13,000 cubic feet per ton minimize to a very appreciable extent the increased cost of capital. The gas industry is by no means neglecting attention to the possible additional capital burden, but is seeking to make the necessary provision to prevent the altered position from becoming permanent. As you may know, the South Metropolitan and the Newcastle and Gateshead Gas Companies have, among others, applied to Parliament for the power to issue redeemable stocks, and for the right to accumulate redemption funds.

Residual Products.

One other factor which helps to determine the price of gas demands our notice—viz., the residual products. The current high prices for coke and sulphate of ammonia cannot, in all probability, be expected to be maintained; but it is certain that residuals will continue to make an important contribution to the reduction of the higher cost of the raw materials. Greater attention is now being paid to coke, local business in it is being cultivated to larger extent, coke is being used largely for steam-raising—as, for example, in the electricity generating stations—and we must acknowledge the use which the London Coke Sales Committee have made of their opportunity owing to the difficulties in connection with coal supplies. As in the case of the extended use of gas during war time already alluded to, the enlarged experience with coke will bear lasting good fruit. We may anticipate, too, that

the work of the Committee of the British Association on Fuel Economy will have a beneficial effect in stimulating the abolition of raw coal and the destruction of its valuable constituents, and the promotion of the use of coke and gas.

Turning to another residual—tar. The end of the war will remove the disadvantage under which this stands at the moment—viz., the high cost of freights, which prevent the exportation of pitch, and the reduced use of tar for road purposes by local authorities. But here, again, the war has by no means been without its compensative advantages. I refer not only to the production of the ingredients for high explosives, but to the production of many chemicals and dyes which formerly came from Germany. In this connection, I should like to refer to the suggestive speech that Mr. Milton Sharp made recently at the annual meeting of the Bradford Dyers' Association, in which speech was sketched the relationship that exists, through the fundamental raw materials being the same, between the provision in this country of sufficient manufacturing capacity for aniline dyes and colours and the protection of the country through the enlarged ability for the making of explosives for war purposes. He asked whether all the work that had been done, and all the plant that had been erected, in connection with the working-up of these raw materials specially for the war were to be sacrificed when hostilities ended? He hoped that as much of it as possible would be made a permanent part of the country's resources. Our interest lies in the fact that a large part of these fundamental raw materials are derived from gas-works; and, this being so, personally, I heartily support the suggestion made by Mr. Thomas Canning in a letter published in the "JOURNAL OF GAS LIGHTING" for March 7 (and commended in the editorial columns), that steps should be taken, by consultation between the organized bodies of the gas industry and those interested in the provision of dyes and colours, to see what can be done for the permanent development of the production, to the largest extent possible, of those fundamental raw materials.

In regard to sulphate of ammonia, the increased interest in the development of the home production of food stuffs has resulted in the Board of Agriculture advising British farmers to use sulphate of ammonia more freely. Once, again, we find the necessities of war time advertising a bye-product of the gas industry.

THE DEMAND FOR GAS.

The final factor in the price of gas which I desire to mention is that of the proportions of the demand. The extent to which gas is used is clearly of importance to general manufacturing, capital, and other charges. An expansion will, other things being equal, lead to a reduction in these charges per 1000 cubic feet. Reading the reports of recent meetings of gas undertakings, our attention must have been arrested by the very significant fact that notwithstanding the higher prices of gas and other obstacles, some undertakings have an actual increase in consumption, while others, making allowance for compulsory restricted lighting, can point to increases in gas sales in other directions. This is not confined to industrial areas, but is found also in residential districts. The significance lies in the fact that the increases in consumption could only have been obtained by an expansion of private business, despite the higher price of gas. In several gas-supply areas also, the average consumption per prepayment meter has increased, probably owing to the enhanced wages of the working classes. This is all of good augury for the future. Some of the factors which have contributed to this increased demand will remain, while others, which are likely I think to be favourable to our industry, will develop. The high price of coal, which has certainly not been without its effect on gas consumption, will, as previously mentioned, probably not be reduced for some time. There will be a continued dearth of domestic labour, owing to the larger use of women in industry. Therefore, labour-saving devices—among which we must certainly class gas appliances—will be in great demand. The British Commercial Gas Association—which has proved so able to take advantage of every opportunity provided by the special circumstances of a condition of war, and has done so much good work in protecting the industry from dangers that have threatened it in these troublesome times—is, in its preparation for the "After-War Campaign," giving full consideration to the domestic servant problem.

Then there is the wide and almost illimitable field of industrial consumption. Even allowing for the enormous increases here which the demand for munitions has brought, I am quite convinced that we have as yet hardly commenced to explore this vast source of business. Now that the peculiar conditions through which we are passing have given such prominence to the importance and value of gas in industry, we must never go back. If we do not take advantage of the opportunity offered to us by circumstances, the blame will lie on our own shoulders. I have no fear of failure. With the energetic support and the wholesome inspiration of the B.C.G.A., on whose work we can confidently rely, I can foresee a great future for gas for power, lighting, and general industrial processes. Every trade, every manufacturing process, must be fully investigated for possible outlets for gas. I have been surprised time after time, when pursuing inquiries into this subject, at the number of trade operations in which I have discovered gas is being used in some way or another. Many of them were, to me, quite new applications of gas; and in many of them the gas was being utilized in the crudest possible manner, without efficiency and without economy. Continued research in this direction, already commenced by the manufacturers and the B.C.G.A., cannot fail to be highly productive. Further, there are many industries to which gas is at present foreign, and which could use it with great advantage. These will need education. The room for possible development indeed appears unlimited. The title of the B.C.G.A. publication, "A Thousand and One Uses for Gas," may one day need expansion to "Ten Thousand Uses for Gas." In the opinion of the Chairman of the Executive Committee of the Association—and on this subject there is no one from whom we would more confidently accept an opinion than Mr. Goodenough—

> "There is an enormous amount of business to be had, an enormous increase to be created in the demand for gas, if we only make up our minds to have it, to create it. The field of domestic and industrial fuel supply has so far only been scratched by the gas industry. We haven't begun to plough it in grim earnest. Think of these figures:
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> |---|---|
> | Coal used in the United Kingdom annually— | |
> | In factories . . . . . | 66 million tons |
> | For domestic purposes . . . . . | 34 " |
> | | 100 million tons |
> | In gas-works . . . . . | 15 million tons |
>
> With such a field as the 100 millions to work at, should it be so very difficult to turn that 15 into 20, 25, and even 30? Is there room for doubt or pessimism here? Surely there are good grounds for belief that the output of gas in this country will increase by leaps and bounds if the whole industry will set itself energetically to seek and get business, not to just wait for what comes to it, and will organize its whole public service so as to win and keep the goodwill and confidence of every business man and every householder."

There is an optimistic ring about these words; but never was optimism better founded.

When the war is brought to a triumphant conclusion, and the nation reverts to its normal activities, the gas industry, with its record of national service and its supreme position of national importance, can with confidence look forward to a future bright with promise and fruitful with rewards for those who will seek to understand and to adapt themselves to the new conditions that will exist.

DISCUSSION.

The CHAIRMAN (Mr. J. H. Balfour Browne, K.C., D.L.) said, before inviting discussion, he thought those present would agree with him when he said that they owed a debt of gratitude and of thanks to Mr. Thornton for his very able and interesting paper. Mr. Thornton had seen what a good number of other people had seen, the absolute necessity of an after-war trade policy. The war began before the present war began. By peaceful penetration, the enemy had secured a very large number of the resources of the Empire; and some of them found exceedingly interesting illustrations in Mr. Thornton's paper—with regard to zinc, nickel, and pulp. He might have given one other illustration, which was referred to in a sub-leader of "The Times" the previous day—tungsten. He saw that Mr. Hughes, the Premier of Australia (who had, in his opinion, introduced a bracing air into the politics of this country, which was so very badly wanted), said what stupendous folly it was that placed in the hands of Germany the monopoly of tungsten powder for hardening steel. This was only another illustration to add to those in the paper. The honeycombing of their trade by Germany must not take place in future. Australia apparently had made up her mind to put an end to it; but he was sorry to say there still seemed to be a shilly-shallying here. Mr. Runciman only the other day, in a speech on this subject of trade, said that after the war Germany should not be allowed to raise her head. That was wise. But the next day he qualified that by saying she should not be allowed to raise her helmet—a very different and a very significant statement. Germany had in that helmet a very wise head, and had in the past organized her war of trade against this country with an efficiency which was not comparable with anything that had taken place here. He thought they must make up their minds that in the future this was not again to take place. It was the duty of the Government, although they did not seem to know it, to protect this country not only in time of war but in time of peace. The country had been learning the great duty of organizing its men and organizing its trade. That was a lesson which, as Mr. Thornton had suggested, should not be lost on them. They must continue to organize the men; they must continue to organize their trade. This, he was convinced, must be the policy of this country if it was to have success in the time to come. He did not know there were any statements in Mr. Thornton's paper with which he would differ. There were one or two in Sir George Paish's quotation with which he should like to quarrel; but it was not the time for quarrelling with Sir George Paish, but for thanking Mr. Thornton for the paper he had read, and for inviting discussion upon it. Mr. Goodenough's name was mentioned in the paper. He would ask him to open the discussion.

Mr. F. W. GOODENOUGH (London) said he was sure all present would agree in associating themselves very heartily with the words that had fallen from the lips of their Chairman on Mr. Thornton's paper. The thanks not only of the Society of British Gas Industries but of the industry as a whole were due to Mr. Thornton in no formal measure, and in no ordinary degree, for an address which he was sure they would concur with him in saying was broad, thoughtful, and thought-provoking. The spirit of it, as it struck him, was one of reasoned optimism. Mr. Thornton had referred to him (Mr. Goodenough) as an optimist. Subject to definition, he would not quarrel with the description. But there were optimists and optimists. There was the optimist that was

typified by the ostrich who tried to avoid dangers by ignoring them. He thought the German people must be of the type of the ostrich optimist, because another quality of the ostrich was that he could swallow almost anything that was put before him. The optimism which he (the speaker) favoured was that sane optimism which, while it did not ignore difficulties but faced them, could always see with the eye of faith a silver lining behind the cloud, and had belief in itself and in the future. He thought they had seen not only a silver lining to the cloud, but even a glimpse of the blue sky beyond in the last few weeks as they looked eastward toward Verdun; and that day they could all feel more optimistic as to the future than they had felt for a long time past. It was because of the spirit, as well as the matter, of Mr. Thornton's address that he felt it was of quite exceptional value. Mr. Thornton had indicated to them the difficulties that they had to face now and in the future, both in the matter of home production and foreign competition. It seemed to him (Mr. Goodenough) that he had rightly indicated the *crux* of the whole of their difficulties during the war and after the war—the *crux* of all their industrial difficulties—when he referred to the question of productivity. The whole question of their industrial prosperity that day and in the future could be summed up in the word "output." Wealth was simply output, *plus* the interest on the output of bygone days which had been saved instead of expended. When considering the question of output, they were faced with one of the biggest difficulties—the difficulty which Mr. Thornton had mentioned—the differences between Capital and Labour with regard to output. Mr. Thornton said that the poorest intellect would not seriously believe that increased output per man would tend to create a shortage of work for other men. He would differ from Mr. Thornton there, because his experience was that some of the most intellectual among the labour leaders at the present time were quite sincerely imbued with the economic fallacy that reduction of output was in the interests of the men in making for higher wages, and in making for employment for more men. This belief, he thought, was generally and genuinely held by labour leaders. This they had somehow or other to overcome before they could make any marked progress in this direction. The opportunity, it seemed to him, of dealing with the problem was presented to them to-day, and must be taken advantage of by capital as fully as possible, because the question of output was fully and forcibly before the minds of labour at the present moment, and now that the great majority of the men had been lead to realize that increase of output was vital to victory in the international war of armies, so they must be brought to realize, if this country was to weather the storms of the future successfully, that victory in the international war of factories would depend also upon increased output. The employers must take the initiative in this matter. They were possessed of larger knowledge and greater intelligence. He said this in no snobbish sense. They had had better education, they had had better opportunities of studying and understanding these problems; and it was for them to bring this question to a thorough discussion with labour, if this war was not to be followed by an industrial war that would spell absolute economic ruin to this country, because while they were fighting their industrial battles, America (which had been much enriched by this war) would be stealing this country's markets in all directions. What was wanted was a conference very quickly between employers and labour, to try and thresh out this difficult question, and for capital to give some sure guarantees to labour, that labour should have increased wages as a result of increased output. The whole labour problem, it seemed to him, was bound upon this question of securing increased output, lower cost of production, and yet at the same time an increased share of wealth to the working classes. He was quite sure it was possible if only the problem was tackled by employers in a broad-minded spirit. Mr. Thornton had emphasized the need of improved education. They needed this. They needed it for the employees of all ranks. They needed trade classes all over the country—not merely the polytechnics with their perfunctory technical education of the present day, but real schools for the training of men for employment in specific industries. Then they wanted education to be increased and broadened by the study of economic questions and the problems of management and distribution (including salesmanship) by the employer class. This country had much to learn from Germany and from the United States in this direction. In what university in this country was there a whole side devoted, with professors and many students, to the study of business management and efficiency? There was such a side, and an important one, at Harvard University; and many most valuable books had been published from that side. He had no doubt that many present had read Bernard Thompson's monumental book on scientific management. This was a product of Harvard University of which the United States might well be proud, and which might lead them to recognize that their equipment in this country educationally was very far behind that of the country which was likely to be after the war one of this country's most serious competitors. In the education of the working classes, they did want, if possible, to get better economic education—not merely better elementary education and trade education, but education that would lead the working classes to know better the true relations of capital and labour, and get rid of those foolish ideas that capital could be abolished altogether—that capital was the cruel tyrant from which labour was suffering—and create in their place sound economic ideas. Mr. Thornton opened up a very inviting field for discussion when he referred to foreign competition. This was a field into which they should not be tempted to stray far that evening. It was not a matter that was directly vital to gas undertakings; it was of much more importance to the Society of British Gas Industries. The policy that should be followed after the war was a very difficult one to determine, and it wanted to be considered and discussed in the most broad-minded spirit, and clear of preconceived ideas. Preconceived ideas were generally regarded as the ideas of the other man; but they must put on one side all their own preconceived ideas, and approach the subject solely from the point of view of the protection not of particular interests, but of the nation as a nation against the insidious attacks of an enemy in the disguise of a competitor. This was the position they had all to face. Whether they had been Free Traders or Tariff Reformers before the war, they had all to recognize that they had now to protect themselves against enemy attacks—not merely against competition. They must, however, be very careful not to give labour any cause to think that the situation was being exploited entirely for capital, and at the expense of labour. They had to take labour into their counsels, and satisfy them that they were sincere in their desire to safeguard the interests of all. His own view in regard to protection against Germany in the future was that such indemnities should be imposed upon her as would cripple her commercially, so far as any question of unfair competition for political ends was concerned, for a generation to come. Mr. Thornton referred to the need of State assistance for industry. This could certainly be given with advantage, provided they did not regard it as a substitute for self-help and organization. They wanted it as an addition to activity and enterprise on our own behalf; they did not want to regard State assistance as any substitute for energy and enterprise on the part of their own industry. He should like to endorse what Mr. Thornton said with regard to the Commercial Department of the Board of Trade, which he had found during the war very efficient for a Government Department, and almost as efficient as a business enterprise, which was saying a good deal. Mr. Thornton referred to the necessity of a State Business-Building Department. This certainly was wanted for the country; but a business-building department was wanted also for every industry; and the Association that he represented that evening he hoped might be regarded as the Business-Building Department for the gas industry. This was the function of the British Commercial Gas Association; and he hoped, with an increasing amount of support from the Society, that they might be able to go forward with increasing results for the industry. Mr. Thornton referred to the fact that their interests were sometimes parallel; sometimes opposite. This was true; and when they differed, they did so with mutual respect. But that evening they could all unite in tendering their congratulations and thanks to Mr. Thornton for his most interesting and able address.

Mr. Thomas Glover (London) said he should like to make one or two points of criticism with reference to some of Mr. Thornton's suggestions, because he thought, after all was said and done, if they were a Society of British Gas Industries, they should offer some concrete suggestions for the improvement not only of the gas industry generally, but of the branches with which the members were particularly connected. He had often been struck—when investigating as far as he could one or two minor branches of the industry with which he happened to be associated, and which he had tried to follow up in other countries—with the very much greater degree of co-operation existing abroad not only (might he say?) between supplier and user of any particular appliance, but between one supplier and another of an article. He thought that if they realized, and paid attention to, the enormous amount of energy and time and money which was lost—not in trying to make improvements for the benefit of the industry with which they were connected, but in what was sometimes called "healthy competition" with each other, possibly they might be able to progress as a body much more readily than they were doing as individuals. There was no doubt that the benefit of co-operation was great right away through an industry. In the gas industry, they had seen that co-operation could to a great extent carry out joint inquiries and research. There was no need to mention these inquiries; they were known to all the members. Mr. Thornton had said that the gas industry was well organized. He (Mr. Glover) should like to qualify that. He did not think the organization was complete. They had the Institution of Gas Engineers (the Senior Vice-President of which, Mr. A. E. Broadberry, was with them that day); they had their own Society, which came next in point of age; they had the British Commercial Gas Association to push the commercial interests—if he might put it that way—of both branches of the industry. What it seemed to him was required was either a further body or an extension of one of the existing bodies, which, for the want of a better term, he would call the "British Technical Gas Association." If such a body could be formed, he thought the spirit of inquiry and of research which was so much in evidence just now could be dealt with by the industry as a whole. There would then be a body in position with funds, staff, and organization to carry on the research and inquiry which were wanted, he thought, in every branch of the manufacturing side, whether of the gas-supply industry or of the branches supplying gas plant and appliances.

Alderman F. Templer Depree, J.P., remarked that Mr. Thornton had said he was not one of those who was enamoured of the proposal to create a new Ministry of Industry and Commerce independent of the Board of Trade, because he considered the Board could very well carry out the duties. Many of them were

members of Chambers of Commerce; and, for a considerable number of years, Chambers of Commerce throughout the country had been endeavouring to get the Government to establish an independent Ministry of Commerce. Only as lately as the early part of March, when a meeting of the Associated Chambers of Commerce took place in London, the opinion was more strongly ventilated than he had heard it in the past twenty years, that a Ministry of Commerce, perfectly independent of the Board of Trade, should be established. As a result of the meeting, Sir Algernon Frith waited upon the Prime Minister, and told Mr. Asquith that they wanted a Minister of Commerce who was specially trained in commerce, and could give his whole time to the work. Mr. Asquith said, "Not a lawyer!" Then he went on to remark—and he (Mr. Depree) considered his argument extremely weak—that he had devoted the greater part of his life to giving business men information as to how they should conduct their business. Now was that a fact? Did they as business men go to a lawyer when they wanted special advice as to the way business should be conducted? They only went to a lawyer when they required a question of law settled, and frequently when they wanted it kept out of the hands of other lawyers. The very grounds on which, as a rule, a lawyer acted was to delay from one process to another, and by so doing increase the fees he was going to make. A business man, on the contrary, took a totally different view. If two business men met, they would settle a point at issue in regard to a contract in a few minutes; if it was referred to lawyers, how long would it take them? He was not making these statements without apprehension, because of his unfortunate proximity to the Chairman. [Laughter.] He disagreed with Mr. Thornton in this matter, and he thought he (Mr. Depree) had a great number of people with him in this particular respect. Mr. Thornton had cut the ground from under his own feet, when he said that he wanted a man with a special business training to conduct this particular business. Mr. Asquith said he did not like running too much in a groove in these matters, and that it was not necessary for a Minister of Commerce to be a business man. But if they looked at the selections Mr. Asquith had made with regard to his own Cabinet, there were a good many of his own profession in it in one position or another. Mr. Thornton was optimistic in looking at a bright trade future; and he (Mr. Depree) believed he was taking the right point of view. He also referred to the education of the working man, and stated that slackness, narrow-mindedness, inability to realize great issues, and lack of perception were among the shortcomings from which the working man at present suffered. This was all very true; and education alone was the remedy. There was another element with which the working man had now to contend, and that was the introduction of female labour. It had been shown that female labour with very little training could in many occupations catch up the working man, who had all his working life been looked upon as a skilled man.

Mr. CYRIL G. DAVIS expressed his gratitude to Mr. Thornton for the very optimistic and cheerful paper he had given them. There was one point with which Mr. Thornton had not dealt, and which appealed to him. The paper treated largely of the manufacturing side of the business. They had got not only to make goods, but they had to learn how to sell them. In this respect he thought this country had in the past been very much behind Germany. Germany had experienced travellers in every country for their foreign trade. There were certainly very critical years in front, and too much preparation could not be made to face the conditions that were coming. He thought it was a matter of great gratification to feel that they had such a keen and live Society as this one to look after the interests of the various manufacturers who belonged to it. What they had heard from Mr. Thornton, who was backed-up by the evidence of eminent authorities, as to the great natural strength of this country was eminently satisfactory. They had learned a great deal from the paper; and he sincerely hoped it would go far and wide, because it would be an education and a surprise to a great many people. He was glad Mr. Thornton had called attention to the patriotic efforts and great assistance that gas had lent to the Government during the present crisis; there was not a man in the room who was not in some way or another assisting to defeat the Germans. The gas industry was strongly organized, as was exemplified by the way in which it had met the difficult war conditions. "Adversity shatters the weak; it fortifies the strong." He believed the industrial lessons which they had had through the war were all wanted, and would be found to have added to their commercial power.

Mr. J. W. BROADHEAD said that, like Mr. Thornton, he was an optimist. He agreed with the view expressed in the paper that after the war there was every reason to look forward to an acceleration of trade; but they must avoid dropping into the position of copyists, as they were in danger of doing prior to the war, and must face the future with the determination not to abate one iota of their wonted initiative in the realms of Art, Science, Commerce, and Industry. If the war were to continue till the approach of anything like exhaustion, London would not retain its position as the clearing-house of the world, except by the greatest possible effort on the part of the whole Empire. The present—particularly the pre-war—stable financial position was due to the fact that they were an industrial and a commercial nation long before the majority of their competitors. Supposing the accumulated wealth was dissipated, and they were called upon to start afresh with anything approaching equality with their competitors, the effort required to regain the previous position must be infinitely greater than ever before. He could not see why their relations with Austro-Hungary after the war should be at all different from those with Germany—as was indicated in the address. He thought this country had sufficient grounds on which to desire to limit equally its trading relations with the Central Powers after the war under all conditions. He was somewhat surprised to find their Chairman of Council holding absolutely contrary views to those unanimously expressed at the recent annual meeting of the Associated Chambers of Commerce with regard to the creation of a Minister of Commerce, and siding with the reply of the Prime Minister to the deputation to him on the subject, at which the question was asked by the Prime Minister as to what was meant by a business man. Some years ago he heard a member of the then Government explain that, in the appointment of men to such positions as (say) President of the Board of Trade, men were advisedly selected who had no special knowledge or experience on the subject, so that they could bring an unbiassed mind to bear upon matters with which they had to deal. Personally, he hoped they would not have much longer to wait for a business man—not a lawyer—to be at the head of a new Department of Commerce, unfettered by any other department, who would also have control of a vastly improved Consular Service. That this service did require remodelling out of recognition was shown by the fact that before the war nearly 50 per cent. of this country's Consuls were either Germans or Austrians. Many of these individuals held joint office for Austria or Germany, and at the same time for Great Britain. It could be easily imagined what zeal and service would be devoted by these men to the interests of this country. Educational matters would undoubtedly be considerably revised in the near future—more particularly in regard to languages and scientific subjects—but co-ordination of effort and organization of all forces throughout the Empire were equally necessary as educational factors. He fully agreed with the Chairman's remark *re* Capital and Labour, particularly with the opinion that the workman lost generally by limiting his value. The trade union standpoint on this subject was a narrow one; and it was to be hoped it would broaden after the war. If not, he felt sure the country would suffer. All classes of the community alike, both brain workers and manual workers, should be prepared, by the greatest adaptability possible, to revise some of their ideas, methods, and habits; and thus bring about a much more friendly relationship between capital and labour than had been the case hitherto. If the war was really teaching them one thing more than another, it was that, as a people, the English had the faculty of organization once circumstances compelled them to exercise it—despite blunders and miscalculations, which, after all, were human attributes. The address was very good—conceived in the right spirit, and was a laudable example of a mental grip of the rapidly changing requirements of the times, and a fair presentation of the prospects of what lay before them. He should like to congratulate their new Chairman on his most able address.

Mr. F. J. WEST moved a hearty vote of thanks to Mr. Thornton. While he thought the address was most admirable, he must differ with Mr. Thornton with regard to the Minister of Commerce. He thought their Chairman had taken a line in regard to this matter that was entirely out of touch with public opinion when he suggested that the Minister of Commerce should be attached to the Board of Trade. To attach a Ministry of Commerce which was to assist industry to a department which in days gone by had shown itself limited with red tape, and had the traditions of many Governments wrapped about it, was, he thought, a great mistake. He did hope that the business men of this country would see to it that in any Ministry of Commerce they had something that was dissociated from the Board of Trade. With regard to Capital and Labour, although there was evidence at the present time of differences with employees and suspicion of employers' motives as to the many alterations that had to be made in equipping themselves for present-day requirements, he thought that they must put themselves into line if they were going to get along together at the conclusion of the war. They must see that the increased prosperity that they expected this country would gain would mean increased prosperity to the workmen. There were employers that day who looked at labour from the point of view of the maximum amount of work for the minimum amount of pay; while the workman looked for maximum pay for the minimum amount of work. They must bring these divergent views a little closer together, and if they did this they would prosper as Mr. Thornton suggested.

Mr. A. P. MAIN seconded the motion, expressing his personal appreciation of the very admirable and able address.

Mr. THORNTON said he did not propose to attempt to reply to all the speakers as time was getting on. He was glad to feel that perhaps the one doubtful point which he had in his own mind with regard to the address was the one on which the members all seemed to disagree with him. He was not sorry now that he had taken this view of the question, because it had undoubtedly induced every speaker to express his opinion on a most important subject. He imagined it represented the view of the Society that State assistance in industry was absolutely necessary; and he thought that the question as to how the head should be established was perhaps not so important, though it was important as how the department should be conducted. If they read his remarks at leisure, they would see that he sketched the foundation of a department which would be for all purposes he thought admirable in every way in regard to permanency and business organization. If the head was to be independent from any other department,

he should not quarrel with the position. Perhaps, after all, if one considered the importance of the subject, and the magnitude of the task, it might be desirable they should have a separate Minister of Commerce. Everybody had been kind in his remarks; and he hoped the result arising from his paper and the discussion would assist and help forward the gas industry.

The CHAIRMAN said he had received a letter from the President-Elect (the Right Hon. H. E. Duke, K.C., M.P.) saying that he was urgently called to the House of Commons, and would be detained for an hour or two, but would endeavour to join the members later. He (Mr. Balfour Browne) agreed with the feeling that if there was to be a Minister of Commerce he should not be a lawyer. It was quite certain they had far too many lawyers in the Government. A Minister of Commerce ought to be a commercial man.

Mr. W. D. HELPS (Leeds) wrote that, owing to the disorganized state of the railway services, he was only able to be present at the meeting for about half-an-hour; otherwise he would have made a few comments on the very valuable and appropriate paper by Mr. Thornton.

He added: I should have pointed out that Mr. Thornton was omitting the most vital factor from his calculations as to what we should have to do after the war. I refer to the inevitable shortage of both labour and brains due to the ravages of this terrible war. We are often told that it is the last "lap" that wins; but in this case I think that it will be the first "lap" that wins. We shall need to fill up the gaps, and to raise the population to its previous level at least. I am of opinion that we shall have to revert to the old-fashioned idea of large families, when seven or eight children to the family were common, whereas the present rate seems to be one or two. I may say that I believe Germany has always appreciated the value of a large population; and, as a consequence, large families are far more frequently met with in that country than in either England or France.

Then, again, there is the question of the relationship between what is known as capital and labour, and in this country I think it is very unfortunate that there should have been this segregation into classes; for when all is said and done both parties are capitalists—one of cash and the other of labour. It appears to me that all the restrictions as to the output and earning capacity of men have had a very serious effect upon the efficiency of the country as a whole. I know many men personally who cannot do themselves justice when working slowly, owing I suppose to some peculiarity of their nervous temperament. It seems to me unfortunate that men of this type should have to so order their pace as to keep in step with a slower individual. One result is that they have to take time off in order to keep favour with their Union; and in many instances this means a good deal of excessive drinking, and other things equally detrimental to a man's efficiency. No doubt, it is due to faults on both sides that the two parties are so consumed by distrust; but I do think that this war, with its bridging of the social gulf which had been artificially created, should do much to wipe out the past and promote fairer dealings between so-called capital and labour. It is to be hoped that this will be possible both in the interests of the individual and of the nation as a whole.

One hears a very insistent demand for a Minister of Commerce; but I think that it is rather a weakness of ours to adopt the ostrich-like policy of pretending to believe that everything is well provided we have a Cabinet Minister overlooking matters. And, by a very strange twist, so soon as we get the Minister, then there is an outcry that everything is not well—apparently, because we have the Minister. When all is said and done, it is to a large extent a matter for the cash capitalist and the labour capitalist to decide how the business of this country shall be directed, though naturally it needs the close co-operation of the Government of the day to ensure any policy decided upon being carried into effect.

Our policy in the past has been very shortsighted when dealing with the natural resources of the Empire. The Germans have been allowed to secure a monopoly of our own natural resources as well as those of our Colonies; and they have used these resources for forging the very weapons they have now turned against us. The only cause I can assign for our lethargy in the past is that we were too successful, and that by creating such a large amount of wealth the later generations became somewhat indifferent. The remedy is fairly obvious—stop slacking and boost-up business to its very utmost and by every possible means.

Our financiers have not assisted business to the extent they might have done, and have (to the tune I believe of hundreds of millions of money) preferred to assist German industries. This should not be; the financial resources of this country should be used for the development of the trade of the whole Empire.

Another question we must ask ourselves is, "Is our education on the right lines, and do we train our boys, both before and after entering business, to secure from them the maximum efficiency?" My answer to this is, "No!" I do not wish to be too critical of our modern educational system, but it always strikes me, so far as the elementary schools are concerned, that a little of everything is taught, but that nothing is done thoroughly. On the higher educational side, one will find a tremendous number of boys taking the "classical"—I have the greatest respect for the "classical," but it has its limits in this workaday world—while so far as elementary education is concerned, one finds boys who when they leave school have a mere smattering of two or three languages and a smattering of most everything else that is not likely to be of any use to them in such vocations as they are likely to take up. Our technical education, though much improved, is still in need of considerable improvement in the way of thoroughness. Boys do not get sufficiently conversant with first principles to enable them to show initiative at a later stage; and the consequence is (to mention only one instance) while we have many draughtsmen in the engineering world, it is not at all a simple matter to get hold of a designer. There, again, I think that the industries concerned should co-operate to keep an eye upon, and develop, the education of people for their own particular line of business. It is useless to depend entirely upon protective tariffs or free trade or any other of the political intriguing cries unless those particularly concerned put their own house in order.

True, steps must be taken to prevent any foreign country securing the same monopoly in the future that we have had in the case of Germany in the past—monopoly of materials, and monopoly of markets—at any cost. While I can quite see that in some cases it is essential to grant a foreigner in this country naturalization, I would go so far as to say, as a general principle, once a German always a German, and for that matter once an Englishman always an Englishman, and to meet this the laws as to naturalization should be revised.

Above all, let us keep open minds and adopt a bold and fearless policy that envisages the whole Empire and every member of that Empire, and avoid the idea that salvation is in the hands of the few, and others may be left to wander in the wilderness.

MODERN COAL AND COKE HANDLING MACHINERY.

A paper on "Modern Coal and Coke Handling Machinery as Used in the Manufacture of Gas," illustrated by an extensive series of diagrams and lantern slides, was read yesterday before the Society of Engineers, at a meeting in Caxton Hall, by Mr. J. E. LISTER, of Messrs. W. J. Jenkins and Co., Limited.

In his opening remarks, the author explained that, in the manufacture of gas in the larger towns, the quantity of material to be dealt with is very great; and the problem of handling it economically becomes a serious matter. To handle the coal and the resultant coke entirely by hand would cost for labour approximately 2s. 6d. per ton; but by the introduction of modern machinery, this figure may be reduced to 9d. per ton, or, if conditions are suitable, to as low a figure as 6d. To obtain such results, however, the plant must be so designed as to require the minimum of attention; and the question of upkeep must not be lost sight of, or the saving of labour will be considerably discounted by the repair bill. In a properly designed plant, the annual amount required for the upkeep of machinery should not greatly exceed 3d. or 4d. per ton, taken over a period of several years.

After a brief reference to earlier machines, the De Brouwer projector and pusher, and their action, were described; and the modern methods of conveying the coal to the overhead hoppers in the retort-house were considered. The author always recommends manganese steel chains for elevators, in preference to the more usual malleable iron, as it is very little more expensive in first cost, and the risk of breakage of the chain is practically eliminated. One of the illustrations showed a complete plant which, together with the steel-framed retort-house, was recently supplied to the Osaka (Japan) Gas Company. The structure had to be made specially strong, on account of the great storms to which the district is subject. In this special ccase, the combined charging and discharging machine is fitted with a weighing chamber; and a hopper holding a 24 hours' supply of coal is arranged in front of each bed of retorts. The elevator, which is of the usual enclosed type, with malleable iron buckets carried on a manganese steel chain, delivers the coal on to a push-bar conveyor, which distributes it into the various hoppers. This arrangement, though more expensive than the central hopper plant in first cost, is rather more economical in working, as with the larger capacity of the storage hoppers, it is only necessary for the coal plant to be worked during the daylight shift.

Scraper or push-plate conveyors are very convenient for dealing with small coal, owing to the ease with which the point of discharge can be altered; while by only partly opening some of the doors, the coal can be made to discharge at two or three points simultaneously.

These conveyors work at speeds between 100 and 200 feet per minute, and vary in size up to 24 inches wide. The capacity of a 24-inch conveyor, with scrapers pitched 2 feet apart, and running at 100 feet per minute, would be approximately 150 tons per hour. This is for a horizontal conveyor. Placing the conveyor on the slope entails a reduction in carrying capacity of about 16 per cent. for each 10° of inclination. The following table gives the approximate capacity of scraper conveyors in tons per hour when handling coal and running at 100 feet per minute, for various sizes and spacing of scrapers:

Size of Scraper.	Distance Apart of Scrapers.			
	16 In.	18 In.	24 In.	
4 in. by 10 in. . . .	30	27	20	Capacity in tons of coal per hour.
5 in. by 12 in. . . .	45	40	30	
6 in. by 18 in. . . .	—	70	50	
8 in. by 20 in. . . .	—	—	90	
10 in. by 24 in. . . .	—	—	150	

These figures to be reduced by 16 per cent. for each 10 per cent. of inclination.

Another type of conveyor very frequently used where large quantities of small coal are to be handled is the gravity-bucket conveyor, which can be used for carrying material both vertically and horizontally; and, by means of suitable tripping gear, the buckets can be made to discharge at any required point of their horizontal travel.

The buckets are generally filled by an automatic feeder, which brings a series of openings or pockets containing a suitable amount of coal over each bucket in turn. This prevents the spilling of the coal, and ensures the buckets being evenly filled.

Band conveyors are frequently used for delivering coal into stores, as, by means of a suitable travelling throw-off carriage, they can be arranged to deliver at any point along the conveyor, and so fill up the stores from end to end. They require very little power in proportion to the amount of material carried; and they are smooth and noiseless in working. Ordinary cotton conveyor belting is very generally used; but a built-up belt of cotton duck and rubber gives by far the best results. The author knows of one installation where a belt of this type has dealt with something in the neighbourhood of 200,000 or 300,000 tons of coal; and the latest information he had, some five or six months ago, was that the one face of the belt was just done for, and it was now to be turned over and the other side used. These belts are naturally much more expensive than those of plain cotton; but for installations where first cost is not the most important item, they are well worth the extra cost. Rubber-faced belts should not, however, be used where the belt is continually subject to heat.

The belts are carried on sets of rollers arranged at short intervals along the framing. A flat belt has the longest life, other things being equal; but a very greatly increased capacity can be obtained by causing the belt to run in a troughed shape. Additional rollers are fixed at longer intervals to prevent side movement of the belt. The carrying side only is troughed, and the return side flat. The angle between the rollers must not be too sharp, or the belt will very soon fail at the corners. The end pulley should not be less in diameter than 5 inches for every ply of the belt—*i.e.*, for a 6-ply belt the pulley should not be less than 30 inches diameter. The working stress in the belt when loaded should not exceed 30 lbs. per inch of width per ply. The following table gives the effective cross section of the layer of material carried by belts of various sizes when running flat and when troughed, and shows the great increase in carrying capacity to be obtained by troughing the belt:

Width of Belt, Inches.	Effective Cross Section of Material. Square Feet.	
	Flat Belts.	Troughed Belts.
18	0·08	0·19
24	0·16	0·34
30	0·27	0·55
36	0·4	0·8

The power required for conveyors of the usual construction is given approximately by the formula—

$$H.P. = \frac{W_B\ (0{\cdot}15L) + W_M\ (H + 0{\cdot}07L)}{33{,}000}$$

Add 5 per cent. for each tripper,

where W_B = weight in pounds of belt (total).
W_M = " " material per minute.
L = length in feet of conveyor.
H = height in feet of lift.

One of the principal London gas companies has recently installed a band conveyor plant for delivering coal from a pontoon or wharf fixed in the Thames to a large bunker arranged over the end of a retort-house. The bunker holds 600 tons; and the conveyor, which can deliver at various intermediate points, has a capacity of 140 tons per hour. All the coal on its way to the bunker passes through a weighing machine, so that a constant check can be kept of the amount of coal carbonized. The conveyor is divided into three sections; and the total length is 465 feet. The width of the belt is 2 ft. 6 in., and the speed 190 feet per minute. The plant is driven by a gas-engine of about 30 H.P.

In some cases the charging machines are themselves fitted with elevators and hoppers holding 7 tons of coal, and there is no overhead storage plant. Instead, openings are left in the wall between the retort-house and the coal-store, and the elevators on the machines can be screwed back into these openings in order to pick up the coal. The elevators can deal with the coal at the rate of 60 tons per hour; so that the time required to fill the hopper is only six or seven minutes, and the machine can then charge about ten retorts before requiring a fresh supply.

Coke-Handling Plants.

There are, said Mr. Lister, two principal methods of dealing mechanically with hot coke—by means of conveyors, and by means of transporters or telphers. Each method has its advantages; and the question as to which shall be adopted must be decided entirely by local conditions. In many cases, a combination of the two is the ideal arrangement; a conveyor being used inside the retort-house, and a telpher outside in the coke-yard. The chief advantages of a conveyor are that it is continuous in action, and therefore does not restrict the speed of the stoking machinery; and when once started to work it is practically automatic in action, and does not require constant attention. One objection that is frequently advanced to the use of conveyors is the breakage of coke said to be caused by them; but if proper attention be given to the design of the plant, the breakage can be reduced to a very small amount. The principal advantages of a telpher plant are the amount of ground that can be covered without an excessive expenditure, and the small amount of handling received by the coke, with a corresponding decrease in the production of breeze. At the same time, with a plant of this type, the speed of the stoking machinery is regulated by the time taken by the transporter to run out with a load, deposit it at the required spot, and return for a fresh charge; and in many cases this results in considerable delay in the working. This delay may not be material in a small plant; but in a large one, it is an important consideration. A man is required constantly on each telpher, which increases the labour cost; but the upkeep cost is light.

A telpher plant will cost approximately £450 for the transporter itself, and £3 to £4 per foot-run for the track; the cost depending mainly on the number of curves and the height of the track above ground level and the load to be carried. A conveying plant will probably cost from £4 to £6 per foot-run; the lower figure being the cost of the portion inside the retort-house, where the trough and return path can be supported from the floor structure, and the higher figure including supporting trestles or other structure for carrying the conveyor at a suitable height above the ground in the coke yard. The ideal arrangement is, however, frequently a combination of the two methods. By arranging a conveyor in the retort-house, with a hopper at the end of the house, capable of holding all the coke produced in one draw, the stoking machinery can work at its full speed, and the telpher can distribute the coke to the required points between the rounds, when there is a man available who would perhaps be otherwise disengaged.

One of the best known hot-coke conveyors was also the invention of M. De Brouwer. One firm alone in this country has made over seven miles; while considerable lengths have been made by Continental firms. Most of the successful hot-coke conveyors now in use are of this type or more or less copies of it.

The chain is built-up of steel stampings, consisting alternately of blocks and side links, held together by steel rivets. At intervals of about 2 feet, the two strands of chain are joined together by a crossbar, which keeps the links the correct distance apart, and drags or pushes the coke along the trough. The side-links are so formed that the whole of the wear is taken up by the bosses working in the blocks, none of the wear coming on the rivets, which merely hold the links together. A chain of this type will deal with 50,000 or 60,000 tons of coke or more during its working life. The chains are protected from coke falling into them by cover angles or tees bolted to the sides of the trough. By slightly altering the shape of the crossbars, conveyors can be arranged at slopes up to 45°. This type of conveyor, suitably modified, is also excellent as a coal-conveyor; the special construction of the chain making the wear negligible, even after several years' work. The working speed of the chain is about 40 to 50 feet per minute; and the power required, 1 H.P. for each 30 feet of horizontal conveyor, and about 1 H.P. for each 20 feet on the incline—depending, of course, on the actual slope. Another type of conveyor which is considered by some engineers to be the best for coke, ashes, and other sharp and gritty materials is the tray or carrying conveyor. This consists of a series of overlapping steel trays fixed to a steel chain running in the conveyor trough. The material is carried quietly along without friction; and in this respect the tray conveyor is good for brittle or friable materials. But in the author's experience, this type of conveyor, when used for coke, at any rate, is more expensive in upkeep than those of the "D.B." type; and if the latter are properly designed and constructed, the amount of breakage of the coke is not appreciably different.

A somewhat novel arrangement has recently been adopted in one or two installations, to enable a large amount of storage space to be covered by the conveyors, with special arrangements for filling railway-waggons or dumping the coke on to the ground without breakage. The retort-house part of the plant is arranged as usual, with an inclined portion outside the house, delivering on to a long yard conveyor. On one or both sides of this yard conveyor, a track is arranged, on which runs a travelling cross-conveyor. These cross-conveyors take their supply of coke from doors and shoots in the yard conveyor trough, and are hinged at the inner ends; the outer ends being slung on chains, by which they can be raised or lowered. The lowering conveyors enable the coke to be placed gently on the ground, instead of dropping it from a considerable height; and as the heap increases the conveyors are raised, thus greatly increasing the storage capacity of the ground. Instead of depositing the coke on the heap, the doors may be closed, the two shoots at the lower end opened, and railway-waggons filled at any point along the sidings.

A telpher or transporter plant is most useful where the coke or other material can be dealt with intermittently, and where a large area of ground is to be covered and the material stacked to a considerable height. The telpher itself consists of a carriage carried on two bogies, which either run on the bottom flange of the track girder or on a single rail riveted on the top flange. The latter arrangement is the better when there are curves to be negotiated, but is somewhat more expensive, as the construction of the track and supports is not quite so simple. The machine is provided with a cabin, in which the attendant sits, and is driven by two electric motors—one for travelling and the other for hoisting. For loads of (say) 1 ton, the travelling motor is of about 7 H.P., and the hoisting motor 11 H.P. In the case of a telpher plant for handling coal and ashes recently erected in London, the bunkers hold 1300 tons of coal, and the plant can unload barges at the rate of about 40 tons per hour. There is a double track, on which two machines can work simultaneously; and weighing machines are embodied in the track girders, so that the actual weight of coal delivered by the barges is checked as it enters the works. Here, as the telpher has to deal with a total load, including the grab, of nearly 3 tons, the hoisting motor is of 25 B.H.P., and the travelling motor of 12 H.P. The hoisting speed is 80 feet per minute, and the travelling speed 450 feet.

Coke-Oven Machinery.

In a section on coke-oven machinery, Mr. Lister described Goodall's patent coke quenching, screening, and loading machine.

The whole process, from commencing to push the coke from the oven to the loading of the waggon, including steaming or drying, occupies about 25 minutes; and one machine will deal with the coke from a battery of fifty ovens. Under these conditions, the labour cost for quenching, screening, and loading into waggons runs out at about 2d. per ton of coke handled, as compared with 8d. per ton on the old flat benches. A motor of about 20 H.P. is ample; the average power taken when dealing with the coke from an 8 or 9 ton charge being only about 14 H.P., which works out at approximately 0·36 unit per ton of coke. Where the railway truck is farther than usual from the ovens, a short screening conveyor is fitted instead of the jigging-screen.

In conclusion, the author remarked that there are many other machines which might have been described without exhausting the subject of coal and coke handling machinery; but the paper had already grown to an undue length. He emphasized again the necessity for the proper design of all such machinery—particularly if not handling coke—in order to keep the cost of maintenance down to the lowest possible point.

MIDLAND EXPERTS AND FUEL ECONOMY.

At a representative meeting which was held last Wednesday evening in the large theatre of Nottingham University College, the "JOURNAL" was utilized to play the part of deputy for Professor William A. Bone, F.R.S. Under the auspices of the local branch of the Society of Chemical Industry, Professor Bone had undertaken to give an address on "Fuel Economy;" and the members of the Nottingham organization had extended an invitation, which had been readily accepted, to representatives of the Derby Society of Engineers, the Leicester Association of Engineers, the Midland Counties Colliery Owners' Association, the Midland Counties Institution of Engineers, the National Association of Colliery Managers, and the Nottingham Society of Engineers to participate in the proceedings, over which Mr. JOHN WHITE, F.I.C, presided. But a disappointment was in store for the audience; the general dislocation of railway traffic, occasioned by the storm, preventing Professor Bone getting through from London. As a basis for subsequent discussion, however, which proved to be of an eminently useful and practical character, the branch Hon. Secretary (Mr. John M. Wilkie) happily had recourse to the "JOURNAL," reading from the issue of March 14 the report of the address delivered by Professor Bone before the London Section of the Society.

In the subsequent discussion,

Professor BULLEID (Nottingham University College) alluded to many of the salient features of Professor Bone's contribution to the subject, observing that, while economies were often commended, there were some which it was occasionally found were not worth carrying out. He had in view more particularly the smaller classes of engineering plants in which, by making extensive additions to existing arrangements, a little saving might be effected upon working expenses, but not large enough to compensate for the extra capital laid out, having regard to the still considerable amount of coal used. Professor Bone had mentioned the domestic hearth and the kitchen fire, which were probably the two worst sinners. In reference to the kitchen fire, if they took into account the number of thermal units released in burning coal and the number actually utilized for cooking, it would be seen that the efficiency was very low. He did not think, however, that, in regard to small matters, it would pay to elaborate plant merely for the purpose of saving coal. The same consideration applied also to small power arrangements. There were heaps of plants where there was one boiler used for generating little power. The coal bill in such cases was a heavy charge in comparison with the other expenses, and more especially was this the case with small portable plant. A lot of coal must be wasted in ordinary blacksmith's hearths. The real saving, however, was to be effected only in regard to the larger units. On some small plants economies were impossible. In large works there were often to be found distributed boilers, each of which served a small engine driving the machinery in a particular shop; and a great deal was being done now to effect economy by piping-up and utilizing steam in a central turbine. As an instance of what was being accomplished at present, they might take the development of blast-furnaces and steel-making plant, in regard to which considerable saving was being effected. Professor Bone had very usefully referred to the work carried on by the Newcastle Electric Company—an enormous concern whose operations extend from Morpeth to Middlesbrough. This undertaking had almost every type of generating plant dotted all over the district and linked-up on the high-tension side. The result was—he believed he was right in saying—consumers there obtained power at ¾d. per unit. A plant such as this was only possible, however, in a large industrial district; being incapable of realization in a small area. It was suggested some time ago that such a plant might be installed in Nottingham and Derby, utilizing waste-gases from blast-furnaces in the district; and he believed that such a scheme would have been very successful if it had been carried out. He trusted that in the course of the discussion something would be heard about the chemical side as to the utilization of the waste or bye products, such as sulphate of ammonia and benzene, which could be recovered when coal was properly burned—products which were now being sent up the chimney in the case of ordinary fires.

Mr. H. SENIOR (Lincoln) expressed regret that Professor Bone was not able to be present, as some interesting questions might have been presented for his consideration. They all appreciated highly the action which the Professor had taken to conserve the coal supplies, and especially was this appreciation felt by engineers who, like himself, were interested in obtaining cheap power chiefly from gas, because there was no doubt gas was the cheapest method of obtaining power per unit. Professor Bone had directed especial attention to the question of house fires; and it was to be gathered that he suggested that in about ten years our supplies of bituminous coal in this country should be conserved—power stations being erected in the vicinity of the coalfields, especial facilities being afforded to gas producers, who would extract the bye-products now so essential for many manufacturing and other purposes. They all knew how wasteful boilers and ordinary fires were under present arrangements; and it was satisfactory therefore to note that one of the Special Committees appointed had been deputed to deal with this important branch of the subject. By a general system of supply from a central source, manufacturers and householders might obtain electric light or gas as well as power and heat; house coal consumption being reduced by gas or electric fires. In this way there would be no need for solid fuel to come to the houses of private individuals or the works of manufacturers. As one way of conserving our supplies, and at the same time adding usefully to the national revenue, he suggested the reimposition of the duty on exported coal. Professor Bone was particularly interested in gas. At many engineer's meetings they had heard it said that what they wanted was less gas and more steam. Had Professor Bone been present, however, he believed they would all have agreed in saying that what they wanted was more gas and less steam.

Mr. R. F. PERCY (Nottingham), as one connected with the mining industry, suggested that economy in regard to fuel should start in the pit. Professor Bone had called attention to the loss at present entailed by what might be called improper working underground; and the subject was of paramount importance. The development of our coal seams being in the hands of private individuals or companies, the one aim at present was to secure as large a return in the way of income for the proprietors or dividends for shareholders. Such an object could not tend to bring about the utilization of the whole of the workable seams in pits, because, in order to get immediately the better class of coal, other coal which was relatively valuable was neglected, or its worth diminished by being broken up or damaged in the process of mining. Barriers dividing various colliery workings were, under present arrangements, oftentimes contorted, and vast quantities of coal were left in the ground to prevent workings from inundation. If, however, the barriers were only laid in straight lines, or followed the natural direction of the faults in the strata, great economy might be effected. At the same time, he did not advocate that they should have too much paternal legislation on the subject.

Dr. CAVAN (Nottingham University) referred to the great value of Dr. Bone's chemical researches in their application to practical problems, characterizing it as an evidence of the rare possibilities which lay within the scope of scientific men.

Mr. RUSHWORTH suggested, in regard to fuel economy, that the process ought to begin on the pit bank and in the boiler-house.

Mr. F. H. CARR (Nottingham) emphasized the gravity of the position by pointing out that coal saving would postpone the day when the industrial supremacy of this nation would be on the wane.

The discussion was continued on practical lines by Mr. Edgecumb (Derby) and others.

Shades and Screens for Restricted Lighting.

A useful and ornamental series of shades and screens for attaching to upright and inverted incandescent burners, so as to meet the requirements of the authorities in the matter of light intensity, are being shown by Messrs. J. & W. B. Smith, of Farringdon Road, E.C. There are cardboard shades, adapted to both styles of burner, for downward lighting or side-light deflection. Or tin ones can be had, if preferred. The bent tin pattern (japanned black outside, and white inside) for inverted burners, is arranged with a wire across the open part near the top edge of the shade; and this wire, when in position, will rest on the top of the burner under the mixing-chamber. For shops and private houses where subdued illumination is the order of the day, there is an excellent choice of linen, chintz, and sateen shades, in different shapes and colours, for inverted burners. Most of them can be supplied for standard, medium, or bijou type burners, and one or other style and colour should harmonize with any surroundings. For attachment, the shades are provided with wires which fit on to the screws of the burner globe gallery. When using them, the globe should be replaced by a clear glass shade and mantle protector which the firm supply for the purpose.

GLASSWARE AND THE GAS INDUSTRY.

This was not the exact title of a paper read before the Illuminating Engineering Society on the 21st ult.; but it is the one that we choose to adopt for the purpose of a notice of the contribution and the discussion, because both turned largely on the requirements of the gas industry. The author was Mr. S. B. Langlands, the Public Lighting Inspector to the Corporation of Glasgow; and the complete title was "Some Aspects of the Design and Use of Glassware in Relation to Natural and Artificial Illumination."

Mr. Langlands stated that the object of the paper was to show the wide scope for study in relation to glassware for illuminating purposes. In the past the country has been dependent to a very large extent on imported glassware. With the outbreak of war, it came to realize more fully its dependent position; and steps are already being taken to improve facilities in this respect. Glass manufacture is essentially an industry which demands scientific treatment; and the problems involved can only be effectually solved by co-operation between those interested in all the various uses of glassware for lighting. At the outbreak of war, there was great inconvenience, particularly in respect to the so-called "heat-resisting" glassware. Much of this was made at Jena. However, manufacturers in this country have already undertaken the production of glassware for use with high-pressure gas and other lamps, in which a considerable amount of heat is developed.

Requirements and Defects.

Glassware for globes and chimneys has to fulfil a number of requirements. It must be suitably transparent, colourless, capable of withstanding heat, durable, and retain its transparency in use. Years ago Mr. Langlands made rigid practical tests of different varieties of glass for a certain burner, with the following results:

(*a*) A German Glass: First in order for durability, but bad for fogging.
(*b*) A German Glass: Second for durability, and better as regards fogging.
(*c*) Jena Glass: Third for durability, but no fogging.
(*d*) British Glass: Fourth for durability; unequal in composition; sometimes fogged, and sometimes did not.
(*e*) American Glass.—Fifth for durability; no fogging.

This test was mentioned because it showed a weakness in the British glass—lack of uniformity, which is essentially a defect that implies want of scientific supervision. The remarkable success of the Jena works (which were State-aided in their infancy) is doubtless due largely to the consistency of the material supplied, and the ability to manufacture again and again a glass with given chemical and physical properties. Fogging is usually ascribed to the presence of lead in the glass. The author was rather inclined to think it was due to crystallization. Jena glass contains no lead. British glass works have now undertaken the manufacture of improved glass in this respect. But if this is to continue, it is essential that the qualities and composition should become standardized on scientific lines.

Standardization.

In addition to the question of standardization of material, there seems an opening for standardization in regard to dimensions of glass for lighting. Those who have had to do with lighting large numbers of buildings know how inconvenient and unnecessary are the great diversities in the sizes of lamp bulbs, chimneys, globes, &c. Standardization in these respects would not only greatly simplify the manufacture of glassware for lighting purposes, but would also prove a convenience to consumers. The sizes selected for globes would naturally depend to a great extent on the candle power of the lamps for which they are intended. In the case of globes for softening and diminishing the light, the size would have reference to temperature limits, and the maintenance of the intrinsic brilliancy of the unit within a convenient value. Probably it would also be affected by æsthetic considerations, as the size of a unit should presumably bear some relation to the size of the interior in which it is used.

Another point on which information would be of interest is the success with which makers in this country have undertaken the production of pressed glass globes in the larger sizes. The Holophane prismatic glassware was established in this country before the war. But it is common knowledge that many of the large white glass units of a decorative kind were imported from abroad; and, says the author, it is surely up to us to produce good work of the kind in this country.

The question of the standardization of material applies also to hemispheres and globes of a diffusing kind. It is well known that the qualities of available white glass differ very much. In some cases—flashed opal for example—uniform illumination over the entire surface is readily obtained; and the filament or mantle is entirely obscured. In other cases—pot opal for example—one can still see the source through the glass, and the diffusion is not so good. It is therefore of interest, from the lighting standpoint, to specify exactly the quality of the glass, so as to secure the requisite uniformity of diffusion, combined with minimum absorption. Similarly, the colour and permanence of such glasses need to be specified. One finds that some varieties of so-called white glass are apt to become tinged with yellow, and that sometimes an uneven density is produced. Such defects will not be found in the finest glassware. Again, in the case of the larger units the weight of the glass is not without significance. In view of the tendency towards the production of sources of high candle power, this element may have an appreciable effect on the question of fixture design. The need for standard dimensions is equally important in the case of reflectors. It is particularly important to check, as far as possible, the tendency on the part of the public to use reflectors which are totally unsuitable for the lamps.

Light Absorption by Glasses.

Another matter requiring the supervision of the Illuminating Engineering Society is the testing of the absorption of glasses and of globes and reflectors composed of various kinds of glass. One finds that there are great differences of opinion regarding the amount of light absorbed by various kinds of glassware; and the uncertainty on this point is intensified by the fact that it is possible to get two varieties of glass which appear very similar to the eye but differ widely in respect of absorption. This, again, is particularly true of white glass, the constitution of which is conveniently analyzed under the microscope. In this way differences in quality may be revealed which would escape the naked eye; and differences in diffusing power may be explained. The preparation of a series of samples of typical glass, accompanied by data as to composition, colour, and absorbing power, would be of great value.

Deleterious Rays.

Another problem for the Society to consider is the production of glasses excluding rays of light which are deleterious for certain classes of work. There has been much discussion during recent years regarding the influence of the ultra-violet rays on eyesight. Whatever be their influence in this respect, it seems to be well established that such rays have a considerable effect in causing the fading of colours of pictures and fabrics. Mr. Langlands understands that in this country a glass has been produced capable of absorbing such rays. Another interesting problem is the production of tinted glass for use with artificial illuminants to produce "artificial daylight." Then experts on photometry could often furnish a hint to those engaged in optical problems. One question which has doubtless often forced itself on the notice of photometrical workers is the production of neutral glass of standard absorbing power. There has been no difficulty in obtaining from abroad neutral glass plates transmitting exactly 10 per cent. of the light; but it has hitherto been difficult to get similar glass in this country.

Co-Ordination of Effort.

In the final part of the paper, Mr. Langlands pointed to the need for the co-ordination of all glass manufacturing efforts by some form of central control. If progress is to be lasting and progressive, the industry must be organized on scientific lines. Even so, we cannot expect rapid progress, for time will be needed before the influence of scientific study begins to tell. In particular it is desirable that the scientific sections of the work, and the standardization of material, should be guided on a co-ordinated plan. The Institute of Chemistry has already done excellent work in publishing formulæ for glass required for various purposes. [Some typical formulæ were reproduced in an appendix to the paper.] The National Physical Laboratory is also doing good work, which only requires greater support to be of immense benefit to the glass industry. Further, from personal experience Mr. Langlands said the Board of Trade have already done a good deal, considering the limits of their powers. Similarly, the Board of Education have been considering the establishing of better educational facilities for instruction in glass-blowing and similar processes involved in the manufacture of scientific instruments.

Proposals Summarized.

In conclusion, Mr. Langlands summarized his proposals thus:

(1) There is need for standardization in respect of materials used in various kinds of glassware required by the lighting industry. It would be very desirable for a complete series of samples to be prepared, attached to each being particulars of the chemical composition, absorbing and diffusing qualities, colour, permanence and durability, and special applications.
(2) An effort should be made to standardize the dimensions of glassware used for lighting purposes; the shapes and sizes of globes and reflectors being limited to a convenient prescribed series.
(3) The conditions of testing the reflecting power and other qualities, from a lighting standpoint, of globes and reflectors should be more precisely formulated.
(4) Efforts should be made to simplify and standardize apparatus for testing different varieties of glass as regards colour.
(5) The Illuminating Engineering Society should co-operate with other bodies in forming a Committee to consider these problems.

DISCUSSION.

The Chairman (Mr. F. W. Goodenough) said the members were much obliged to Mr. Langlands for having given a paper indicating many subjects of pressing importance at the present time, and which called for scientific research and treatment. The industrial side of the problem was a serious one; and it stood very much in the way of the scientific and commercial development of the glass industry in this country. It was hoped these difficulties would be overcome. He was glad Mr. Langlands had said a good word for the Board of Trade, with regard to what

they had done within the limits of the powers they possessed. His own experience of the Commercial Department of the Board during the war had been a very gratifying one.

Mr. W. C. Clinton (University College) wrote to the effect that he was doubtful whether in this country we have attained to that pitch of perfection in the manufacture and design of glassware that would make standardization desirable, as suggested in Mr. Langlands' proposals Nos. 1, 2, and 4; but Nos. 3 and 5 were deserving of very serious attention. Behind all this though, Mr. Clinton said, was the question of the Government attitude to specialized industries in general. Until a direct pronouncement could be forced from them as to their attitude in regard to the murderous competition that will ensue after the war, it was little use discussing anything.

Messrs. Stevens and Williams (Stourbridge) (in a written communication) said they were in accord with the expression in the paper as to the need of standardizing various kinds of glass, and the dimensions of the glassware used in the lighting industries. Owing to the scientific knowledge of glass gained by the Germans through the establishment of the Jena laboratories, they were able to capture the bulk of the lighting industry. The writers, however, were confident that if efforts were made in the direction of scientific investigation in this country, backed by the Government, England would be in a far better position than formerly to compete in the markets of the world.

Alderman R. Burtles (Messrs. Burtles, Tate, and Co., of Manchester) stated in a letter that, since the war started, his firm had, along with other firms, gone in for the manufacture of glass for lighting purposes; and he could endorse the very great importance of the need of standardization not only of the materials used in the various kinds of lighting glassware, but also of the sizes. At the present time, every lamp maker seemed to go in for special sizes of his own, which caused much inconvenience and the carrying of extra stocks. Almost all railway companies, too, had different sizes for their glass bowls. With regard to the heat-resisting properties of British made globes, there was a great deal to be said in regard to the regular distribution of the glass throughout the globe; and the reason globes were now so much improved since British manufacturers commenced to make them was because the operative glass makers, being continuously making various sizes of globes, were, by practice, more efficient in this respect—blowing them out in more regular thickness. If the glass was distributed irregularly, causing varying thicknesses, the globes could not so well stand the varying temperatures to which they were subjected. Hence it was questionable whether all the blame attributed to the composition of the glass was due to this cause alone. In his opinion, the addition of a certain amount of lead oxide (red lead) to the composition of the mixing tended to mellow the glass, enabling it to be worked more uniformly, and also tending to assist the contraction and expansion caused by the varying degrees of heat inherent to their use.

Mr. Bertram Blount, as a member of the Committee of the Institute of Chemistry, thought their work had resulted in something practicable. The Board of Trade had backed them up nobly. Through the Board, they had obtained a few hundreds of pounds from the Treasury with which to pursue research.

Mr. Hancock (also a member of the Committee) stated that several manufacturers had actually undertaken the making of glass goods according to the Committee's formulæ. A number of difficulties had been encountered; and the Institute had been asked whether they were prepared to render further help. The bulk of the work of the Committee had been carried out by Professor Jackson, of King's College, who had also rendered valuable help to the manufacturers. Mr. Langlands had referred to glass which excluded the ultra-violet rays. On this subject, a great deal of useful work was done by Professor William Crookes some years ago. One of the problems that confronted the Committee in taking up this work was the question of obtaining the necessary skilled workmen; but this now seemed to have been overcome. Mr. Langlands, he thought, had been extremely ambitious in his scheme. He did not say this in any spirit of detriment at all—in fact, if the scheme was undertaken, he hoped it would be in a thorough way, so that the interests of them all could be co-ordinated. He hoped manufacturers would come forward and be prepared to take part in the whole scheme; for they had the possibility of carrying on an important and lucrative business.

Mr. E. Stroud remarked that the war had certainly brought home the extent to which this country was dependent on countries abroad for many forms of glass, especially glass of a heat-resisting character. With Holophane glass these difficulties had not arisen, since glassware of this kind was manufactured here. Regarding the points as to precision in manufacture and standardization in regard to composition and form of mould, any kind of glassware which was stated to give certain illumination values with a certain type of lamp must, of course, be accurately manufactured. The moulds used for Holophane glass had to be made with the very greatest care. In the larger sizes, the number of calculated faces might amount to many hundreds; and the correct reflection of the rays depended on the angle of the prisms being exact, and the surface of the glass highly finished. Seeing that they dealt with transparent glass, they had the advantage of extremely low absorption values. Concerning the question of heat-resisting power, the Holophane reflectors had been adopted very widely for gas; and there was no difficulty in obtaining units which did not crack or discolour with heat. Success in this respect was often as much a matter of correct design of unit, provision for ventilation, and expansion of glass and gallery as quality of glass. As to standardization of dimensions, the first step in this direction should be taken by makers of lamps and burners, to whose requirements manufacturers of reflectors must, in the main, conform.

Mr. A. P. Trotter mentioned that, when he brought out his dioptric shade before the Holophane system, he tried to get British manufacturers to undertake its production; and he met with a great deal of difficulty. Most of them said it was a perfectly impossible thing to do. Of one of them, he inquired, "What is your refractive index for flint glass?" The reply was: "We do not keep any." [Laughter.] About this so-called opal glass, which was a convenient term covering a large number of different kinds of diffusing glass, the Americans were far ahead of this country. They had magnificent laboratories where they had carried out researches upon the subject. He gave particulars of how, instead of flashing an opalescent diffusing glass over clear glass, the Americans made a thick opal glass, which incorporated a thin solution of the diffusing substance in the glass itself. He agreed with the author that this subject of glass was one that should be carefully studied by a representative Committee. Regarding the author's conclusions, there were difficulties. Mr. Langlands spoke of the standardization of moulds, and asked for samples. It would be a good thing to have samples to which one could refer; but he doubted whether the manufacturers would be prepared to attach to them the chemical composition. The great thing was to be able to buy what one asked for; and he thought some sort of precise trade names would be better. As to the standardization of the dimensions of glassware, that was all very good; but there was a great deal too much standardization in these days. He rather hesitated about standardization which would limit sizes too much.

Dr. M. W. Travers said it was only within the last six or eight months that the firm with which he was connected had been considering lamp globes at all. Jena gas globes and chemical glass were practically the same. The ideal glass had not yet been obtained. One had to choose between certain bad qualities in glass. "Monopol" glass would stand high temperature; Jena glass would not fog. "Monopol" glass contained lead, and a small portion of antimony. Jena glass contained neither. The antimony made the glass more resisting to changes of temperature; but it was attacked more on the surface by sulphur. Personally, he would prefer making glass highly heat-resisting, and put up with a slight fogging. He should like to know which gas engineers preferred. Standardization had its advantages and disadvantages; it was another word for sterilization. But they must remember there were many different ways of producing glass; and methods were varied to fit in with works practices. With regard to sizes, he was simply appalled at the gas-globes that were brought before him; there were about 150 kinds in all. This was a large order for the glass manufacturer to take on, and to keep in stock. One must remember that every time a man was changed over from one globe or bowl to another, there was waste. The globe blower would have to scrap quite a large amount of material before he got his first globe. He would remind gas experts that in designing new forms of globes, they were increasing the difficulties of glass manufacturers.

Mr. J. S. Dow said it would be helpful if one could hear the views of people connected with the gas and oil industries with regard to the difficulties they had in connection with glassware, because the statements one heard from the different firms about what was being done were rather inconsistent. Many firms claimed to make heat-resisting glass; but the qualities varied very much. Some of them were not so satisfactory as they at first sight appeared to be. One felt that standardization did not want to be carried too far; but he did think that, in connection with glassware for lighting, something was required of the same definite character as the Institute of Chemistry had prepared for glass to be used for chemical work. A formula was also badly wanted for a suitable white (or opal) glass; and for photometry it was really a matter of importance to get a neutral glass of known absorbing power.

Mr. O. P. Macfarlane said that "Monopol" was certainly a very tough glass; but, in his opinion, it was exceeded in its heat-resisting power by a glass called "Resisto." Jena was in his experience of third-rate quality as regard heat-resisting power. It was of good quality in regard to clearness and absence of fogging; but "Monopol" glass was one which offended in some degree in this respect. The production of heat-resisting glass in this country should be a very lucrative business. But it required very careful manipulation. The quality and the thickness of the glass was important, because they could not expect glass of varying thickness to stand the intense heat produced by the incandescent light. It was encouraging to see the efforts that were being made by British manufacturers to overcome the obvious difficulties of lack of experience and lack of skilled workmen. The Americans had endeavoured to supply this country; but he had been greatly disappointed with consignments from America. It had the appearance of approaching closely to the German glass; but it had not its heat-resisting quality.

Mr. Leon Gaster remarked that in regard to standardization of sizes, it was ridiculous to have so many thicknesses and diameters of glassware to suit every manufacturer's particular lamps. The fewer the standard types required, the better would be the position of manufacturers to meet the demand, and make a commercial success of it.

Mr. W. M. Mason said that five or six of the largest of the gas

companies in the kingdom would require in one year approximately 3 million pieces of glassware, of at least a value of £50,000. He supposed the bulk of this glassware originally came from Germany and Austria. At the time of the Industries Fair, he was asked to go and find out what the British glass manufacturers were prepared to do, or were doing, in this matter for the gas industry. He had to report that, so far as he could find out, there was no glass manufacturer prepared to do anything on a practical scale. One man—he was a Scotsman [Laughter]—said quite bluntly, "The whole point is this: We are not going to put down £10,000 or £20,000 for the gas industry, and immediately the war is over for the demand for glass to go back to Germany and Austria." As a practical man, he (Mr. Mason) thought that what was wanted was a Committee to make some working arrangement with the gas companies and municipalities owning gas-works to support after the war the people who were prepared to spend thousands upon this business here.

Mr. R. W. Hood remarked as to standardization that the lighting industry could not expect to get all it wanted if it had such a large variety of patterns and sizes.

Mr. Guy Campbell thought it would be some years before the British glass makers could meet all the requirements of the lighting trade. The demand was greater than the capacity of the glass-works at present—more especially in regard to labour. In his view, standardization of quality must be mainly a question of price; but standardization of shapes and sizes was a good idea, because the shapes and sizes constituted at present a very big problem, and a very large capital expenditure.

Mr. G. Herbert spoke of the difficulty of getting in this country a standard well glass. He showed three examples from the same consignment from a British maker, which differed in some respect, although required to be uniform.

Mr. Langlands, in his reply, asked that it should not be considered that he was fond of standardization any more than anyone else. He was looking at the question from the point of view of the present, and what were the practical lines upon which to proceed in the circumstances.

YORKSHIRE JUNIOR GAS ASSOCIATION.

Visit to the Vertical Retort Installation at Birkshall.

After a period during which the programme of the session of the Yorkshire Junior Gas Association has been interfered with by present-day circumstances, there was a re-union of the members of the Association on Saturday afternoon, on the occasion of a visit to the Birkshall Gas-Works of the Bradford Corporation, by invitation of Mr. Charles Wood, the Engineer and Manager, to view a 5 million cubic feet installation of vertical retorts.

Messrs. E. J. Sutcliffe, the Deputy-Engineer of the Bradford gas undertaking; Mr. H. Akam, the Manager of the Birkshall works; Mr. E. Gillett, Manager of the Thornton Road works; Mr. Charles Roper, Superintendent of the Mains Department; Mr. H. Higham, Chief Draughtsman; and Mr. T. A. Haslock, Clerk of Works in progress, acted as guides to the small parties into which the visitors were divided.

The visitors were conducted past two large old-type gasholders to the works in course of construction. Many gentlemen remarked upon the generous amount of open ground space which is a feature of the Birkshall works. Before proceeding to the main object of the visit, the parties passed through a large old horizontal retort-house, disused and empty for many years.

Passing to the new works, the visitors were shown the drawings and blue prints, and then taken to see the work section by section. The work was begun in July, 1914, just before the war broke out. [The concrete foundations and other features were described by Mr. E. J. Sutcliffe in a paper read before the Association last year.*] The foundations were finished twelve months ago. The whole work has been handicapped and delayed through shortage of men and other circumstances arising out of the war.

Coal and Coke Handling Plant.

The visitors were shown the coal and coke plant, by which coal is to be brought by railway truck to the siding at the northern end of the buildings and discharged by a waggon-tipper into an underground receiving hopper of 80 tons capacity. This hopper was practically complete; and the guides mentioned that the pit around its outside was built in step formation for convenience of painting, repairs, &c. From the hopper the coal is to be fed by means of a jigger—which was laid down—into a 100-ton per hour coal-breaker; provision being made for bye-passing the small coal. It was mentioned here that the foundations in this part of the undertaking were the work of the department itself. The concrete walls of the hopper and breaker pits vary in thickness, but are generally about 2 ft. 6 in. thick. The depth of the pits is 48 feet. The excavation had been slightly handicapped by the nature of the soil; and some trouble arose through a large drain which was found to run down the centre.

The delivery shoot from the coal-breaker will feed the coal into a rotary filler placed over a short 100-ton per hour gravity bucket conveyor, which will elevate and deposit the coal into two hoppers, each of 50 tons capacity, situated overhead alongside the breaker pit. From the two overhead hoppers the coal, it was shown, will be fed by rotary fillers to two 100-ton per hour gravity bucket conveyors, each completely encircling—over and below—one line of retort-settings. These conveyors will elevate the coal over the overhead storage hoppers above the retort-settings, and discharge it through travelling two-way shoots into the compartments reserved for it, which, as was seen by the visitors later, are two compartments for coal and one (half size) for coke, for each setting. The remaining space of the coke compartment provides room for the pipes which will convey the return gas from the retorts to the foul-gas main.

There will, it was demonstrated, be continuous working by these conveyors, which will go on filling the coal-hoppers at the same time that other parts of the chain of buckets are dealing with the coke as it is withdrawn—elevating it to the storage hoppers above the retort-settings, whence it will be taken for charging the producers, or filling retorts after scurfing. The coke not required here will be conveyed outside the south end of the building, and either deposited directly into the yard for storage, or on to one of the two screening plants fitted above the overhead storage hoppers at this end of the house. These hoppers—of 180 tons capacity—are carried one half over the railway track for the feeding of trucks, and the other half over the yard for carts or bags.

The storage hoppers above the retorts have a capacity of 42 tons per setting, which was shown to be equivalent to a forty-eight hour maximum coal consumption, or a total overhead storage of 840 tons of coal; and these could be filled or emptied without trimming. What the overhead storage of coke might be was not stated; but the President (Mr. John Demain), when the visitors had mounted to the top floor, judged the compartments to provide a coke storage of roughly 100 tons. In case of breakdown by either gravity bucket conveyor encircling the two lines of settings, there is to be a travelling crossband conveyor, of a capacity of 100 tons per hour, between the settings, so arranged as to be able to take coal from either conveyor to any of the settings on the opposite side. The machinery so far inspected is to be electrically driven.

The Vertical Installation.

Passing down to the lower floors, the visitors inspected the installation of 80 vertical retorts arranged in two parallel lines of two benches, each bench of five settings of four retorts. Each retort is approximately capable of carbonizing 5¼ tons of coal per twenty-four hours, providing a total for the plant of 420 tons, yielding 5,250,000 cubic feet of gas per twenty-four hours. The retorts are 25 feet long, and are brick built throughout. Ninety-six courses of 3-inch bricks were used; the joints being not more than ⅛-inch thick. The retort bricks are grooved and tongued to prevent leakage, and panelled-out at the back, so that heat may readily pass through the wall to the charge.

By means of chalked guide markings on one of the settings, as a sample, the visitors were able to see that the carbonization chambers are vertical, and the division walls of tongued and grooved bricks, bonded with the walls of the retort and also with the back walls of the flue, forming a simple, but strong, structure. The primary air, it was shown, is heated by being carried round the bottom of each retort, and then conducted under the producer bars. The secondary air is heated by the waste gases from the combustion chambers.

Some members remarked upon the flat-topped tar-main, lifted by a ring in the footspace. Very particular interest was taken in the gas off-takes, which are of the arched type, and provided with a patent revolving disc valve, so that each retort may be shut-off entirely from the hydraulic main when scurfing. One hydraulic main or sealpot is provided for each setting, having an opening so that easy access may be obtained for cleaning if necessary. A main gas outlet pipe from the sealpot is so arranged that the gases are made to impinge on the surface of the liquor, in order that heavy particles may be removed.

In further examination, some favourable comment was passed upon the large tension relief springs between the two benches on either side of the house, which largely obviate any necessity of screwing-up or releasing, according to tension of gas expansion. The furnaces are to be clinkered by hydraulically driven machinery; shoots being provided for carrying away the clinker, &c., where it can be collected by carts.

From the storage hoppers over the settings the coal will be fed through special valves into the four-hour auxiliary supply hoppers attached to the top mouthpiece, from which the coal will fall into the retorts at a speed governed by the rate of coke extraction at the bottom. The coke-extractors are of the worm type. The extractor is fitted above a hopper holding a four-hours' make of coke, and closed by a water-sealed door. The contents of the hoppers will be discharged through travelling rotary fillers into the gravity-bucket conveyor on its course at the bottom of the building, and removed. The coke-extractors, unlike the other machinery, will be driven by gas-engines.

Votes of Thanks.

The whole party later assembled in the offices, where

The President (Mr. John Demain) proposed a hearty vote of thanks to Mr. Charles Wood and the gentlemen who had acted as guides. Although there was no gas-making going on on the plant, it had been more instructive, perhaps, than would have been the case if work had been proceeding, and they had had to hurry round, instead of being able to examine everything in comfort and at leisure.

Mr. J. B. Balmforth, in seconding the motion, said the visit had

* See "Journal," Vol. CXXIX., p. 142.

been particularly instructive; and it would be still more instructive if they could have another visit when the plant got into work.

The motion was heartily carried.

DEATH OF LIEUTENANT C. V. TOWNSEND.

The PRESIDENT said he had a very sad duty to perform. They doubtless had all heard of the death, in action in France, of Lieutenant C. V. Townsend, of Hereford, a former member of the Association, who, but for having left Yorkshire, and thereby left the Association, would have been this year's President. He proposed a vote of condolence with Mrs. Townsend and the relatives.

The motion was carried by all present rising in silence.

THE NATURAL GAS INDUSTRY.

A paper dealing with the progress and importance of the natural gas industry was read on the 21st ult., before the Institution of Petroleum Technologists, by Dr. J. A. LEO HENDERSON, who reviewed generally the growth of the industry, and indicated the great importance of this natural fuel to all countries in which it may be found and developed.

Referring to natural coal gas, the author said that, while no evidence exists that the natural gas of any of the known profitable deposits in the world has been derived from coal deposits, yet in considering this question it is well to bear in mind that valuable natural gas deposits are found within coal measures, in porous sandstones lying between or above coal-seams; and, further, that the gases derived from coal-beds and those of many natural gas deposits have little to distinguish them in respect of composition and character. Moreover, the facts that the amount of gas confined within coal seams is enormous in the aggregate, that the yield of methane of some seams during mining operations is in some mines equal to that of very large gas wells—a yield which is continuous over a great many years—and that coal gas "blowers," both from fissures in the immediate neighbourhood of coal deposits and from porous beds lying above coal-seams, in districts where no liquid petroleum or natural petroleum gas is known to exist, are at times very persistent and of great magnitude, indicate the possibility (indeed, the probability) that accumulations of coal gas in porous strata do exist in profitable quantity, and should not be ignored. As is the case with natural gas, coal gas is most abundant in the coals of the Palæozoic age. Though the gas is also present in the younger and more bituminous coals and in lignite, it does not escape readily; while, in the absence of fissuring, an impermeable roof conserves the gas in the coal, and as would be expected, larger quantities of gas are found in anticlines. It seems strange in these modern times of scientific effort, that nothing can be done to save part at least, and to utilize the enormous outflow of a valuable fuel, which must amount to many tens of millions of cubic feet a day in Great Britain alone.

The natural-gas industry at the present time, said Dr. Henderson, is practically confined to the United States and Canada; and therefore its progress and importance must be studied from its record in these countries. To the United States belongs the credit of first recognizing the great value and possibilities of this mineral, and of establishing the industry on a firm basis. Thus, natural gas by 1913 had risen to the sixth place in importance among the mineral products of the United States (excluding clay and cement). This, in the greatest mineral-producing country in the world, is no mean achievement. Prior to 1891, the gas was sold at flat rates—*i.e.*, unmetered—at almost nominal prices; but with the gradual introduction of meters from 1891 onwards, and the re-organization of the industry, the supplies were regulated, and payment according to consumption was inaugurated. The evil effect of the years of reckless waste and misuse were keenly felt until about 1898, when the industry appeared to take a new lease of life, and rapidly rose from a yearly value of about $15,296,000 (£3,143,000) to over $94,115,000 (£19,336,000) in 1914, or an increase of over six times during sixteen years. The total production of natural gas in the United States up to the end of 1914 from the inception of the industry exceeds $1,056,000,000 (£217,000,000). As Canada produced in 1914 gas to the value of $3,651,256 (£750,259), the total value of the industry in the United States and Canada in 1914 was $97,766,780 (£20,087,000); while the value of the total natural gas production of both countries to the end of 1914 amounts to $1,077,591,178 (£221,423,379).

The extent of the gasfields in the United States has been estimated by the Geological Survey at 9365 square miles; and in 1914 over 10,600,000 acres were controlled by gas producers. The production in 1914—*i.e.*, over 96 per cent. of the world's output—amounted to 591,866,733,000 cubic feet.

Of other parts of the Empire, mention should be made of the natural gas possibilities of the great Triassic-Jurassic artesian basin of Australia. In this, the largest artesian basin of the world, numerous boreholes yielding large flows of water have been sunk in Queensland, New South Wales, and South Australia. The principal water-bearing sandstone is of great but varying thickness, from 100 to 200 feet, and appears to be as massive and persistent over a very great area as is the well-known Dakota sandstone of the extensive Cretaceous artesian basin in North America, which extends from Colorado in the United States as far as the Athabasca River in North-Western Canada. Sandstones of such persistent massive type have, until recently, been considered unpropitious to the accumulation in profitable quantities of petroleum and natural gas, especially when apparently saturated throughout with water; but the recent discoveries of natural gas in great quantity in the Dakota sandstone in Canada, and also in the United States, have proved the fallacy of this assumption. Mr. J. B. Henderson, in his evidence before the Interstate Conference on Artesian Water, in 1912, gave it as his opinion that natural gas is found in greater or less quantities nearly all over the State of Queensland.

It would appear that the widespread evidence of the presence of natural gas within this basin warrants a most thorough geological investigation, accompanied by practical boring tests, by the Government. Very promising appear the prospects for the establishment of a natural-gas industry of importance in Transylvania, where, at Kissarmas, very large quantities of gas have been developed during recent years. Attention has also been drawn to the prospects for development of natural gas in quantity both in Rumania and Galicia; but no developments of importance have yet taken place. Russia produces a relatively small amount of natural gas from the Tertiary Surakhani gasfield; and Italy contributed an output of 212,330,000 feet in 1913, the gas occurring also in Tertiary beds.

After dealing at some length with natural-gas gasoline, derived from "wet" or "casing-head" gas, which is obtained chiefly from petroleum wells, the author touched upon the bye-products of natural gas, and concluded a statistical section by remarking that, if the enormous waste which has taken place in the history of the natural-gas industry be taken into consideration—estimated by authorities at between two and three times the total quantity of gas consumed—it may be submitted, even if allowance be made for waste in petroleum production, that the evidence is strongly in favour of the assumption that the total yield of natural gas has exceeded that of petroleum, not only in weight, but also, if natural gas be considered as a liquid, in volume, as well as in value. Thus the comparison of the two industries up to date is in favour of the little-appreciated natural gas in every respect, from the national standpoint. It also throws into relief the appalling nature of the waste, the necessity for sympathetic and wise, but strict, legislation to preserve for the use of the people this most perfect, but most elusive, of all natural fuels, and the great stability of the industry if properly regulated and safeguarded. It is much to be hoped that those other countries which are allowing natural gas to be wasted unchecked, or which possess undeveloped natural-gas resources, will study the history of the North American natural-gas industry, and will appreciate the importance and significance of this fuel as a national asset, before enacting laws for the regulation of the development and exploration of the mineral in their own lands.

DISCUSSION.

The PRESIDENT (Sir Boverton Redwood, Bart.) said he was glad the author devoted so much time to the subject of waste, and had not scrupled to use somewhat strong language in dealing with it. In several of the present and prospective oilfields of the British Empire, the natural gas industry was either in its infancy or as yet unborn; and consequently the opportunity presented itself of taking advantage of the experience gained in the United States, and, by the adoption in good time of the necessary measures, preventing the appalling waste that had occurred in the States of the most valuable of natural fuels. He hoped the attention of the authorities responsible for such matters would be drawn to the paper.

Professor CADMAN remarked that the association of a natural gas with coal was a subject of vital importance to the country. Ten years ago, he undertook an investigation for a Mine Commission, in which he examined the atmosphere of the mines in this country, and discovered that there were many mines from which large volumes of methane—the natural exudation product from gas—were being poured into the atmosphere. There were mines giving off upwards of 4 million cubic feet of gas per day, which, of course, was mixed with air; and the chemical and physical problem of the extraction of this energy awaited solution. Taking 270 million tons of coal per annum as the output of the country, he estimated that from 1½ to 2½ million cubic feet of natural gas were daily pouring out from the mines into the atmosphere of this country. It was a very difficult problem to extract 1 or 2 per cent. of methane from the atmosphere; but it occurred in some mines in very large quantities under considerable pressure.

Mr. W. H. DALTON said he was of opinion, as he reported many years ago, that there was only sufficient natural gas at Heathfield, in this country, to supply a few hotels for a short term of years. There was a very small dome in a limited area.

Mr. HENDERSON said he had visited Heathfield; and he came to the conclusion that sufficient care had not been taken in casing the wells and excluding water.

DETERMINATION OF SULPHUR IN SPENT OXIDE.

The March 15 issue of the "Journal of the Society of Chemical Industry" contained the text of a paper on this subject contributed to the meeting of the Sydney Section of the Society, on Nov. 17 last year, by Mr. E. V. Espenhahn.

The author wrote: The determination of free sulphur in iron oxide used for the purification of coal gas is generally carried out by extracting the sulphur with carbon bisulphide. This method presents difficulties in obtaining accurate results, even

when no tar is present in the oxide. This impurity increases with the amount of sulphur, and is also dissolved by the carbon bisulphide; so that errors to the extent of 2 to 5 per cent. may result. The oxidation of the sulphur in the extract and its determination as barium sulphate to eliminate this error, is tedious and, for the inexperienced, not easy to carry out.

The author had occasion to determine the sulphur in a natural oxide, which had also taken up a quantity of tar oils, carried forward by the gas. No method tried possessed the degree of accuracy required for a quick and reliable estimation. A suitable one has been worked out, based on the reaction first applied by M. Greger in 1881, who found that pyrites, when heated with iron, was reduced to ferrous sulphide, which gives off its sulphur as hydrogen sulphide on treating with a strong acid.

From 0·4 to 0·7 gramme of the oxide, finely powdered in an agate mortar, is weighed into a beaker and decanted twice with hot water. It is then run on to a small filter and washed with the aid of a filter pump until the solution gives no precipitate with barium chloride. After drying, the oxide is scraped into a small hard-glass crucible, about 30 mm. long and 10 mm. in diameter —preferably made from ordinary combustion tubing. Here it is well mixed with 4 grammes of reduced powdered iron, and covered with a layer of the same. The crucible is fitted into a hole in a board of asbestos; and the air displaced by carbon dioxide is led in through a pipette, which terminates in a short point slightly above the layer of iron. A small flame is first applied, and the temperature raised until the crucible reaches dull redness, which is maintained for 7 to 10 minutes. After cooling in the atmosphere of carbon dioxide, the contents of the crucible are allowed to fall into a small Erlenmeyer flask, which is connected to three wash-bottles, each containing 150 c.c. of $N/10$ iodine solution, acidified with hydrochloric acid, and a fourth with a few c.c. $N/10$ thiosulphate solution. The mass is covered with water; and after passing carbon dioxide for a few minutes, 50 c.c. of concentrated hydrochloric acid is run in through a funnel. The reaction should not proceed too rapidly, but a steady evolution of gas may be maintained by means of a small flame. As it slackens, the solution is heated to boiling, and a steady stream of carbon dioxide passed through the flask for ten minutes. The excess of iodine is titrated back with thiosulphate, as well as the small amount held in the sulphur, which is extracted with a few cubic centimetres of carbon bisulphide. In calculating results, allowance must be made for impurities in the reagents, which are determined by a blank test.

Determination of Free Sulphur.

It was found that the accuracy was not influenced by organic compounds such as tar. Sublimed sulphur was distilled, powdered, and dried, and a weighed portion mixed with the powdered iron. The results, using about 0·2 gramme of sulphur, indicated 99·83 and 99·88 per cent. of sulphur. About the same weight of middle and tar oils was mixed with the sulphur, and the mass carefully fused. The results showed 100·11 and 99·86 per cent. of sulphur.

Determination of Free Sulphur and Tar in the Spent Oxide.

The amount of free sulphur determined direct as hydrogen sulphide in two different samples was 41·40 and 33·79 per cent.

For the determination of tar, the material was extracted with carbon bisulphide in a Soxhlet apparatus, special precautions being taken to prevent any particles of oxide being carried over into the weighing flask. The carbon bisulphide was then distilled on the water bath, and a current of air passed through the flask to dispel the last traces of the solvent. The percentages of extract (tar and sulphur) found were 46·18 and 34·17 per cent. Deducting the percentages of free sulphur found as above, the amount of tar was indicated as 4·78 and 0·38 per cent. in the two samples.

The free sulphur was determined by extraction [*supra*], after the extract had been dried to constant weight at a temperature of 106° C. The figures obtained were 41·43 and 33·94 per cent. of sulphur respectively.

When tar is to be determined, the first method of estimating free sulphur is preferable to the extraction process. Besides, by drying, the extract is rendered hard and difficult to separate from the flask without breaking it.

Results obtained by the direct determination, provided the sample is sufficiently finely powdered and washed, agree to within 0·1 to 0·2 per cent., though they may differ to a greater extent when compared with those found by extraction. By the latter method, however, concordant results are by no means easy to obtain. As both the sulphur and sulphides of iron are converted into ferrous sulphide, the first method permits the estimation of the free sulphur in the oxide before revivification has been carried out. An error of any magnitude would only be introduced by the presence of insoluble sulphates, as calcium sulphate, in larger quantities, as these are only partly removed on washing, and are reduced on heating with metallic iron.

Determination of Total Sulphur.

During the period of contact with the gas, and subsequent revivification by air, part of the absorbed sulphur of the oxide enters into combination to form sulphates and thiocyanates. The amounts of these salts present indicate the conditions existing during the treatment of the oxide, and to what extent the loss of free sulphur has taken place. The amount of this fixed sulphur is arrived at from the difference between the total and free sulphur. The former is determined by heating the finely powdered and unwashed oxide with metallic iron, whereby thiocyanates and sulphates are likewise converted into ferrous sulphide. This also includes the sulphur of the original material, for which, in the case of artificial oxides, a correction is often necessary.

If the control of purification is rendered necessary by undue losses of sulphur, the sulphur compounds may be estimated as follows: The difference between the sulphur of the thiocyanates and the fixed sulphur denotes the sulphur in the oxidized form; and hence, by determining the thiocyanates, the sulphates are arrived at. In the above oxides the sulphur was found to be distributed as follows:

Sulphur—Per Cent.

—	Total.	Free.	Fixed.	As CNS.	As SO_4.	CNS Per Cent.	SO Per Cent.
Sample I. . .	44·46	41·40	3·06	1·03	2·03	1·87	6·09
,, II. . .	39·66	33 79	5·87	0·86	5·01	1·56	15·01

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Tar and Pitch Prices.

Sir,—Having read with much interest the experiences of your correspondents, in regard to the above, we should like to present another side of the picture.

Pitch has been valued in most of our sliding-scale tar contracts since the beginning of the war at prices varying from 22s. 6d. to 15s. per ton; but during the whole of this period, it has not been possible for us to effect any sales.

We were invited last week, by one of the largest gas companies in this district, to quote for pitch for carbonization, and have to-day received their reply—that our price of 12s. 6d. per ton is too dear, and this notwithstanding that the carriage is only 2s. per ton.

Perhaps this will convince Mr. Gray, and your other correspondents, that all distillers are "not tarred with the same brush," and that there is no ground for the suggestion that "tar distillers are not disposed to assist patriotic endeavours designed for the relief of their own stated difficulties."

March 30, 1916. Yorkshire.

Tar Road-Surfacing.

Sir,—In the "Journal" for March 7, this subject is referred to. There is too much tar used. It comes out on the surface of the roads, by pressure and the sun. In some plaees one can print bis footmark in it. This tar is just submitted to slow distillation by the rays of the sun. It evaporates into the atmosphere until the pitch gets hard. Then the hard pitch remaining is ground into fine dust by the traffic. One can see that the trees on the road have a brown tint. People, too, who are not used to tarred roads are affected by the smell.

The remedy is in putting just enough pitch to bind the road, and in topping the road with grit and then sand to finish—passing a roller over it. Then if the tar is again fetched on to the surface by the hot weather, it is only necessary to see that sand is rolled over it.

Using raw gas tar is most injurious to travellers, besides being a loss of valuable products.

Thoroughly distilled tar, with as little creosote as possible and used boiling hot, will be less injurious to people.

In briquette making, if too much pitch is put in, the briquettes will not stand the sun. Some people think 9 to 11 per cent. is required; while others try to make a hard briquette with 5 per cent. But then it must be small and submitted to a very considerable pressure.

Toulon, March 27, 1916. C. Dasnières.

Gas Companies and Research Work.

Sir,—I was much interested when going through the issue of the "Journal" for March 21 to find an article reprinted from the American "Gas Age," in which it is stated that a number of American gas companies have combined to found a research department in connection with the Johns Hopkins University, Baltimore, to deal with developments in connection with coal tar and co-related products. In my personal opinion such a step is one that should commend itself generally to all interested in the gas and coke-oven industries.

Having had to deal in an exhaustive manner with the production of hydrocarbon products from brown coal tar oils—an industry in which German chemists have been pre-eminent hitherto—I found that the work opened-up to such a wide range of developments that it led to an extensive scheme of research work in regard to the above and other forms of hydrocarbons.

Part of the work has embraced the collection of data in regard to other countries, and progress made in treating hydrocarbons generally. Being in the possession of this information, and having an appreciation of the probable after-effects thereof, I consider the present an opportune time to suggest to gas companies the importance of an effort being made to keep pace with the progress in general, and more especially so in view of the possibilities now opening-up of competing products, derived from petroleums.

G. P. Lewis.

Birkbeck Bank Chambers, Holborn, March 28, 1916.

REGISTER OF PATENTS.

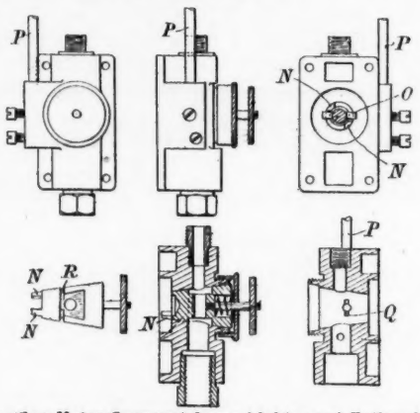
Automatic Lighting and Extinguishing of Gas-Lamps.

KING, W. E., and the GAS-METER COMPANY, LIMITED, of Kingsland Road, N.E.

No. 3964; March 12, 1915.

This invention relates to mechanism operated by clockwork and set to light and extinguish gas-lamps at definite times; the clockwork being arranged to drive the gas-valve always in the one direction and at each operation through half-a-phase of motion, so that one operation lights up, the next extinguishes, and so on.

The illustration shows front, side, and rear elevations of the valve adapted for automatic and hand control in accordance with the invention; also vertical sections of different parts.



King's (Gas-Meter Company) Lamp Lighter and Extinguisher.

The valve body (provided with the usual gas-passage with connections for the supply pipe and burner, and with flanges for fixing the casing of the clockwork control mechanism) is formed with a conical seating for the reception of the taper plug which is held in its seating by a cap, which screws on to a flange surrounding the seating and enabling the plug to be removed for cleaning or oiling. A light helical spring in a recess in the plug bears against the cap and plug, and presses it into its seating. A stem on the plug, projecting through the cap, is provided with a milled head or handle for enabling the cock to be operated by hand. At the opposite end, the plug is slotted transversely to form opposite projections N, between which a cross-bar O, carried on the end of a spindle operated by the clockwork mechanism (not shown), engages to rotate the plug. The slot in the plug is sufficiently large to permit of the independent operation of the plug by hand when it is desired to turn on the gas before the time at which the automatic mechanism is set to operate. The bye-pass tube P communicates with the gas-pipe, through the aperture Q in the valve seating and the annular groove R in the plug, to supply the pilot light.

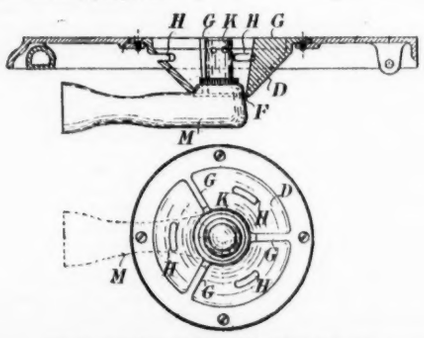
If it is desired to light up earlier than the hour at which the clock is set to operate, the plug is turned up by hand, and at the usual time of lighting-up the crossbar O is rotated by the timing mechanism, and the slack taken up, so that it is then left in position to be extinguished at the set time; or should it be desired to extinguish the light before the usual lighting-up time, this can be done by turning the plug back to its original position.

Gas Cooking-Stoves.

DAVIS, H. N., and TWIGG, W. R., of Luton.

No. 5275; April 7, 1915.

The object of this invention is "to increase the heating efficiency of gas cooking-stoves by reducing the loss of heat due to radiation, convection, and draughts of cold air, and by employing a burner which may be placed in close proximity to the vessel to be heated without mpairing its heating properties."



Davis and Twigg's Gas Cooking-Stoves.

The upper plate of the stove is formed with a circular aperture, the edge of which is provided with a rebate so as to form a recess to admit the flange of a hollow inverted coned screen D. The upper surface of the flange of the screen is flush with the surface of the top plate. The lower end of the cone is open at F; and radially disposed around the interior of the cone are gills or brackets G, which extend towards its centre, for the purpose of supporting vessels. Vent holes H in the walls of the screen allow the products of combustion to pass away.

The burner consists of a hollow cylindrical tube closed at its upper end K, and provided with a shoulder and a threaded shank for securing it in the mixing-chamber M. A little below the end K of the burner are a number of holes to form nozzles. The burner protrudes into the cone from beneath, and is of such a length that when a vessel is placed on the stove its base touches (or nearly so) the closed end of the burner.

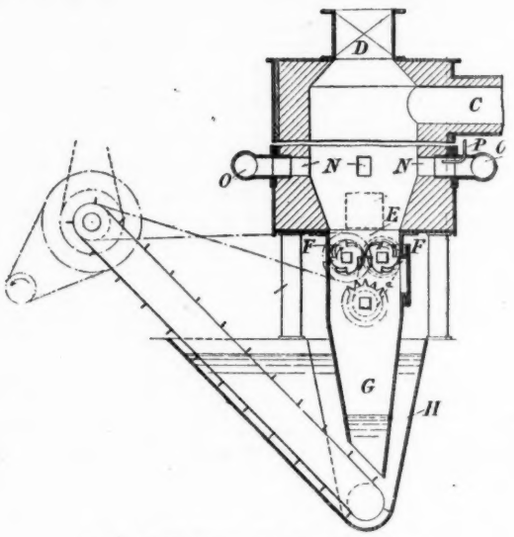
By making the burner with nozzles a considerable distance above the mixing-chamber, it is claimed that "small, sharp, intensely hot jets are produced which may be arranged close beneath the base of a vessel without the flames spreading."

Water-Gas Generators.

BANCROFT, F. J., and HANSFORD, J. B., of Barnet.

No. 5737; April 16, 1915.

This invention refers to "a method of generating water gas and to apparatus therefor, such apparatus being of a kind that comprises a generator chamber to which an air blast and steam can be alternately admitted, and which is furnished with a device for successively feeding fuel to, and with mechanical means for discharging materials from, it."



Bancroft and Hansford's Water-Gas Plant.

The grateless producer chamber shown is provided with an outlet C for the gas produced, an opening D at the top for the admission of fuel, and an outlet E at the bottom for the withdrawal of clinker and ash. The usual grate-bars are omitted from the chamber; but at its lower end there are pairs of rollers (with teeth or cutters F) mounted upon spindles operated so as to revolve adjacent rollers in opposite directions. The rollers break up any clinker that has formed, and force it down into a delivery shoot or hopper G that dips into a water-seal chamber H. Arranged to traverse the chamber below the delivery end of the shoot is an endless conveyor passing round drums adapted to be driven from any available source of power. With a view to clearing away, and so preventing any accumulation of clinker or ash below the rollers F, a toothed roller may be arranged between each pair at a suitable distance below them. These clearing rollers would be keyed to a shaft immediately above, and be adapted to be put in gear with either of these shafts so as to turn in one or other direction as required.

The air-blast, conveyed through the valved main O, is admitted to the producer chamber through ports N distributed around the chamber wall. These ports are at appropriate distances above the revolvable rollers F, and afford protection to the branches from the main O. The steam required for the production of gas can also be conveniently admitted through the ports N from a pipe P fitted with a regulating valve and connected with any source of supply.

The coke to be treated is fed from a hopper into the producer chamber by means of a hollow drum revolved by hand or mechanically in gas-tight manner within a segmental casing at the top of the chamber. Upon inverting the drum, after the fuel from the hopper has been fed into it, the charge falls through the bottom of the casing into the chamber—an operation performed so that a sufficient quantity of coke is fed into the generator to make good the loss in working, and also to maintain an even level of fuel.

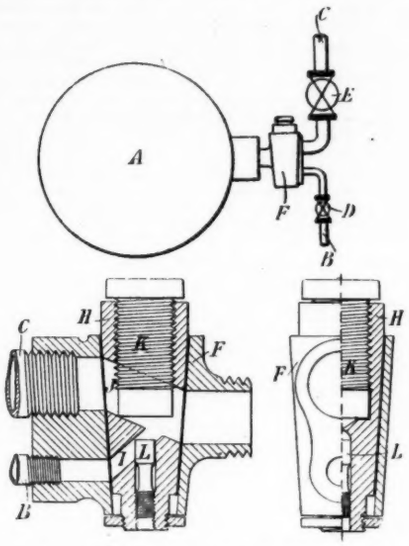
Utilizing Combustible Gaseous Mixtures.

IONIDES, A. C., JUN., of Porchester Terrace, W.

No. 5984; April 21, 1915.

This invention consists in a supply system for apparatus burning a combustible gaseous mixture which is proportioned by passing the constituents through separate adjustable passageways in the plug of a double-ported valve—the conduit for each constituent being fitted with

an independent valve, so that, after once correctly adjusting the proportions of the gaseous mixture, the supply may be shut off or either constituent temporarily controlled without affecting the adjustment.



Ionides' Gas Furnace Burner Regulator.

In carrying the invention into effect, as shown in the small diagram, applied by way of example to (say) a heating installation, comprising a furnace A of the type described in patent No. 2839 of 1912, the gas and air are conveyed in separate conduits B C, controlled by independent main valves D E, and admixed and admitted in the immediate neighbourhood of the furnace burner. In addition to the main gas and air valves D E, there is provided a double-ported valve F (shown in section), enabling the mixture to be controlled in volume and varied in strength. The plug H is provided with two ports or passages I J, so situated with respect to the gas and air conduits B C that the supply of gas and of air to the mixing-chamber can be simultaneously established or simultaneously cut off. The plug is provided at each end with openings extending from the upper end into the port J and from the lower end into the port I. In the upper opening there is fitted a screw-threaded stopper K, having a flat inner end followed by a plain cylindrical part which fits a seating prepared in the passage J and enabling the stopper K, when screwed right home, completely to close the passage. Within the lower opening a stopper L is also provided, which in like manner may completely close the port I when screwed into its extreme inward position. The areas of the ports J I may then be separately adjusted to give any desired proportions of air and gas in the mixture.

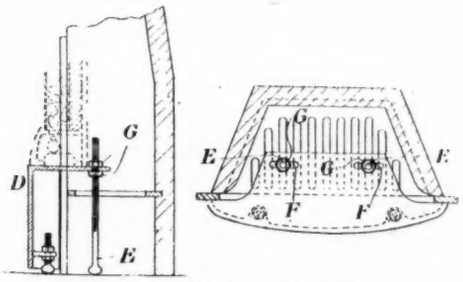
When a furnace provided with the arrangement is in operation, all the valves E, D, and F are open; while adjustment of the strength of the mixture is effected by the stoppers K L. If, therefore, for any reason the furnace is to be temporarily put out of action, it is only necessary to cut-off the supply of mixture by turning the plug H of the double-ported valve F, which, being operable without interfering with the adjustment of the mixture, only requires to be opened when the furnace is to be restarted.

Stands or Supports for Gas-Fires.

VALENTINE, H. S., of Glasgow.

No. 9072; June 21, 1915.

The object of this invention is to provide a combined fender or fret and support or shelf on which a gas-fire can be placed so as to be capable of vertical adjustment.



Valentine's Adjustable Supports for Gas-Fires.

The vertical section and plan show a combined fender-support inserted in place in an existing coal-grate of the "register" pattern.

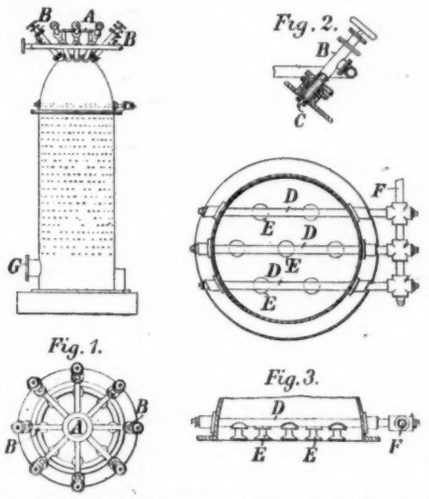
The fender-support D is held up at the back by feet E formed as screwed rods passing through slots F and held in position by jam-nuts G. The fender portion is provided with feet I in the form of short screwed rods passed through holes in lugs and held in position by means of jam-nuts. In this way, the fender-support can be adapted to an existing coal-grate, and also adjusted to inequalities in the hearth.

Gas-Scrubbers.

MILES, T. V., and NEWTON, CHAMBERS, AND CO., LIMITED, of Thorncliffe, near Sheffield.

No. 8766; June 14, 1915.

In a scrubber or washer constructed according to this invention the upper end of the tower is provided with a ring of adjustable nozzles projecting inwardly, and converging downwardly beneath a gas inlet, formed by tapering the upper end of the tower to an opening. Steam at low pressure conveyed to these nozzles issues with the effect that the gas is drawn into the scrubber through the inlet above the nozzles. "The steam is condensed on the dust particles carried by the incoming gas, and the water of condensation, together with the gas, then passes through an upper grid to which water is supplied; the water being sprayed over the upper surface of the grid and trickling through the latter." From the grid the gas and water pass through numerous grids superposed one on the other; and, finally, the gas escapes through an outlet at the lower end of the scrubber, while the dirty water is drawn off separately.



Miles' (Newton, Chambers, and Co.) Scrubbers and Washers.

Fig. 1 is a side elevation and plan of the scrubber; fig. 2 illustrates one of the valves employed for supplying steam; fig. 3 is a plan and side elevation of the means for spraying water.

The scrubber is provided with grids of the kind usually employed, and the upper end of it is furnished with a conical cap having an inlet A. Around the inlet is a steam-pipe, whereon are mounted valves B inclined downwardly and converging towards one another. The ends of the valve project into the cap and pass through glands formed upon it. Each valve spindle terminates in a tapered end C, which passes through a valve seating. The steam supply is controlled by adjusting the valve spindle so that the annular opening around the end C is increased or diminished as required. The lower end of the cap is provided with a spraying device comprising horizontal pipes D furnished with sprinklers E and having at one of their ends valves which control the supply of water from a pipe F.

Water is sprayed upon the uppermost of the grids, while steam is supplied by the valves B into the cap. The gas on entering the cap at A is "first acted upon by the steam and subjected to agitation so that the foreign particles grow larger, and then these particles are entrapped by the water spray before the further operation of washing." The cleansed gas escapes by the outlet G at the lower end of the scrubber, and the dirty water is drawn off separately.

Gas-Producers.

MORGAN, P. B., of Worcester, Mass., U.S.A.

No. 15,717; May 10, 1915.

This invention relates in particular to means for supporting the shell or casing of the producer, whereby the discharge of ashes from it may be effected by employing the ash-discharging mechanism described in his earlier patent, No. 6999 of 1915. It relates also to improved means for distributing the blast of air, or air and steam, to the incandescent mass of fuel within the shell of the producer.

West Gloucestershire Water Company.—In their report for the year 1915, the Directors state that the revenue from water-rates, &c., amounted to £13,971, an increase of £642, and the working expenses to £6747, leaving a net revenue of £7224. From this the year's interest on debenture stock and temporary loans has to be deducted, leaving (with £4719 brought forward) £9400 available for dividend upon the ordinary share capital. But having regard to the fact that all the cash resources of the Company still are required to discharge urgent capital outlays, the Directors recommend the amount to be carried forward to the credit of next year's revenue account, and thus be available for distribution as dividend if by that time the Company are enabled to issue new capital to reinstate the revenue account. The capital expended during the year was £10,307. The length of mains laid during the year was about 3 miles. The Act passed in the last session gives the Directors power to raise an additional £20,000 of loan capital, and to raise part, or the whole, of the unissued loan capital without having first to raise share capital; and also to charge to capital account interest on the cost of new works.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:

Bill read the third time, passed, and returned to the Commons amended: Aberdeen Corporation Water.

Bill reported, with amendments: Imperial Continental Gas Association.

HOUSE OF COMMONS.

The following further progress has been made with Bills:

Bills reported, with amendments: Plymouth and Stonehouse Gas, Uxbridge Gas, Wakefield Corporation Water.

Bill reported, without amendment: Gas Provisional Orders.

The London County Council have withdrawn their petition against the South Metropolitan Gas Company's Bill. The petitions presented against the Folkestone Gas Bill have also been withdrawn. Both Bills have now been referred to the Unopposed Bills Committee.

Sulphate of Ammonia.

In a written answer, in reply to a question put by Sir WALTER ESSEX, who asked the Parliamentary Secretary to the Board of Agriculture whether he had any intention of removing the embargo on the export of sulphate of ammonia, Mr. ACLAND said: The general prohibition of the issue of licences for export has now been in operation for two-and-a-half months, and farmers have had ample opportunity for purchasing their supplies. Considerable supplies have been secured for agricultural purposes; but as there is not sufficient agricultural demand to prevent congestion of supplies and the risk of closing-down works in some of the chief producing centres, it has been decided to resume the issue of licences after the end of this month. Care will, however, be taken to see that sufficient supplies are retained in this country to meet all home needs.

Evasions of the Coal Mines (Limitations) Act.

Last Wednesday, Sir A. MARKHAM asked the President of the Board of Trade whether he had any information that the Coal Mines (Limitations) Act was in many cases not being carried out; would he introduce an amending Bill providing that the average price of each quality of coal sold in the twelve months preceding the war should be substituted in place of the corresponding price, such schedule of prices to be forwarded to the Board of Trade; and would he at the same time make it a criminal offence for anyone to sell coal at the pits above the scheduled prices other than for export purposes?

Mr. PRETYMAN replied that the Board of Trade had received complaints from time to time that the Act was being infringed, but, so far as they were aware, no case in which its infringement was alleged had come before the Courts. He doubted whether amending legislation on the lines suggested was desirable.

Sir A. MARKHAM: Are we to understand that although an Act of Parliament has been passed, the Board of Trade do not intend to introduce legislation to see that the Act is carried into effect? Is my hon. friend aware that the Act is being evaded?

Mr. PRETYMAN: The Act is, on the whole, being very fully observed. There have been complaints; but so far they have been very few in number, and none of them has been carried to the Courts. There does not appear to us to be any justification for re-opening the question here or for asking for further legislation.

Sir A. MARKHAM: Both buyers and consumers are saying that they will not observe the Act, and are making bargains irrespective of the Act altogether? Having regard to this fact, will steps be taken to see that the Act of Parliament is enforced?

Mr. PRETYMAN: We are perfectly prepared to consider any actual facts laid before the Board of Trade.

Mr. PRINGLE asked if Mr. Pretyman was aware that going into Court had proved a futile remedy for the purposes of the Act, adding that no merchant would go into Court without he was refused all supplies.

PLYMOUTH AND STONEHOUSE GAS BILL.

Last Thursday this Bill came before the Unopposed Bills Committee of the House of Commons, presided over by the DEPUTY-CHAIRMAN, Mr. Whitley.

Mr. H. R. CRIPPS (Messrs. Dyson and Co., Parliamentary Agents) said that the Bill was promoted by the Plymouth and Stonehouse Gas Company under rather exceptional circumstances. The proprietor of a large tar-distilling business in Plymouth died a short time ago, and left the business to his son. Unfortunately, the son was killed in the early stages of the war; and it had become necessary for the Trustees of the estate to sell the business. The works took most of the tar from the Plymouth and Stonehouse Gas Company, and negotiations had taken place between the Chairman of the Company and the Executor of the firm (Mr. T. H. Harvey) by which an arrangement had been arrived at for the Company to buy-out the tar business and carry it on. It was a business closely allied to that of a gas undertaking, and one carried on by most gas companies. The desirability of continuing the works was demonstrated by the fact that this particular tar business was doing much work for the Ministry of Munitions in providing materials which formed the basis of high explosives. Although the Company had no power to carry on the business until the present proposal was sanctioned by Parliament, it was, as a matter of fact, carrying it on at the moment, in order that there should be no shortage in the supply to the Ministry of Munitions. This was the main object of the Bill—namely, to carry on the Harvey tar business, and also for the utilization of residual products. The next object of the Bill was to change the illuminating power test to the calorific value test; and the form of clause was adopted which provided for the actual standard figure of B.Th.U. being taken without any margin before penalties would begin to be incurred. Another object of the Bill was to issue redeemable debenture stock, and to provide a redemption fund. A General Act of Parliament passed last year authorized the issue of redeemable debenture stock by any statutory company. The term "statutory company" was defined as meaning "any railway company, canal company, dock company, water company, or other company incorporated by Special Act." This was a wide definition; but it was common knowledge that it was not intended to apply to gas companies (even though incorporated by Special Acts), for the reason that there were special provisions applying to gas companies in regard to the position of the shareholders and consumers under the sliding-scale.

The CHAIRMAN asked if there had ever been an application to test the question as to whether gas companies were included in the definition.

Mr. CRIPPS said so far as he was aware there had been none.

Mr. MOON, K.C. (Speaker's Counsel), said the Act only applied to debenture stock already authorized at the time the General Act was passed; it did not enable anybody to issue fresh debenture stock. The Plymouth and Stonehouse Gas Bill, however, proposed to issue new stock as well as to apply the provisions of the General Act to stock already authorized.

Mr. CRIPPS said the position was that at the present moment gas companies, like all others, had to pay an unduly high price for money; and unless some form of redeemable security was authorized they would for all time have to pay the high rate of interest which the present abnormal circumstances necessitated. It might be that 5½ per cent. must be offered to attract capital now; and this 5½ per cent. would have to be paid for all time.

The CHAIRMAN said that redeemable debenture stock of this nature had been sanctioned in recent years to other companies—notably railway companies—but this was the first case of a gas company applying for them.

Mr. MOON said there were two questions involved—one that the Company should be allowed to issue redeemable debenture stock and, secondly, that it should be allowed to create a redemption fund for the purpose of redeeming the stock.

The CHAIRMAN pointed out that this might bring about a position in the future that the consumers would have to be charged a higher price for gas (in order to meet the expenses of the redemption fund) than would otherwise be the case.

Mr. CRIPPS admitted that, assuming 1d. per 1000 cubic feet was the cost of the redemption fund, this amount would have to go on the price of gas; but then it would be necessary for the gas company to reduce its dividends proportionally. It would only be a continuation of the partnership between the shareholders and consumers which the sliding-scale set up.

Mr. MOON said he would like to put it this way: If the Company wanted £20,000 worth of debentures issued apart from the question of redeemable stock, this amount would be a permanent charge, and no redemption fund would be set aside to redeem it. Why should the Company now be allowed, at the expense of the consumer, to set aside a redemption fund?

Mr. CRIPPS said that if he issued redeemable stock he would get it on better terms than if he issued a continued security; and it was not a good thing for the shareholders or consumers to have high charges of this sort continuing.

Mr. MOON pointed out that at present the Company could re-issue when debentures fell in; and, therefore, it was not necessary to provide a redemption fund.

The CHAIRMAN said that apparently the point was that, whereas the Company might have to pay 5 per cent. for a ten-year redeemable stock, at the end of that period it might be able to replace it with a 4 per cent. stock. The sole question was whether, in addition, the Company should have the right to provide a sinking-fund to pay off the ten-year stock.

Mr. CRIPPS agreed, and said that otherwise they might have to re-issue the debentures at a higher rate.

The CHAIRMAN replied that the Committee had to watch the interests of the consumer under these claims.

Mr. CRIPPS suggested that the soundest finance for the Company was the best for the consumer in the end.

The CHAIRMAN said that he might agree with this only the consumers ten years hence might not be the present ones.

Mr. MOON asked Mr. Cripps if he would be satisfied with having the power to issue redeemable stock without the power to create a redemption fund.

Mr. CRIPPS replied that this would leave him entirely at the mercy of the circumstances at the time the redemption arose.

The CHAIRMAN said the Company would be able to re-issue at the end of ten years, but must take its chance as to the rate for money being higher or lower.

Mr. CRIPPS said it was a question of principle. In this particular case it did not matter very much so long as he got the power to get rid of the higher charge, because only a comparatively small amount was involved; but there were other cases which he believed were coming before the Committee where it was a question of a considerable amount. It was really only applying the principle of a sinking fund at present imposed upon all local authorities.

The CHAIRMAN pointed out that in all Gas Bills there were distinct provisions for reserve and depreciation funds, and this proposal was an addition to all that.

Mr. MOON added that it seemed an unlimited addition.

Mr. CRIPPS said it was limited by the amount asked for in the Bill.

Mr. MOON also pointed out that it would be possible for the Company to issue debentures for a short period, the redemption fund upon which might amount to an increase of 10 per cent. in the price of gas.

The CHAIRMAN said that, as this was the first case, it was very important for the Committee to watch it carefully.

Mr. CRIPPS suggested that as the matter was also under the consideration of the Lord Chairman of Committees, perhaps the Bill might go

forward subject to any agreed form of wording arrived at between the authorities of the two Houses being inserted.

This course was eventually agreed to.

Mr. CRIPPS reserved the right to drop the proposal for a redemption fund if necessary meanwhile.

The CHAIRMAN intimated that the Committee were really against the question of the power to create the redemption fund, and not against the issue of redeemable debentures.

Mr. MOON pointed out that it was still necessary for the Company to justify the £30,000 of additional debenture stock, seeing that there were considerable unexercised powers to issue such stock.

Mr. CRIPPS said that the existing sums which could be raised by debenture stock would be required for the ordinary purposes of the Company. The £30,000 were required in connection with the tar-works; and it was desirable to keep this quite distinct from the gas capital.

Sir *Joseph Bellamy*, the Chairman of the Company, said that the arrangement with Messrs. Harvey was that the purchase price of the tar-works should be £15,000 of 5½ per cent. redeemable debenture stock, in addition to which a further £10,000 were required for plant, &c., and the remaining £5000 for working capital, also for the tar-works —this being about the present amount of working capital in the business. With regard to the right to issue ordinary debentures, already authorized, as redeemable debentures, the desire was to come within the meaning of the clause of the General Act referred to; these capital powers having been granted before the war. The Company had purchased land from the Plymouth Corporation for the construction of new gas-works; and it would probably be necessary to use part of the existing debenture powers for this purpose.

Mr. MOON reminded witness that this scheme was a little bit outside the ambit of a gas-works. He was not in any way hostile; but there was considerable discussion with chemical manufacturers some time ago about the form of clause by which gas companies should be entitled to manufacture bye-products; and a standard form of clause was arranged. The clause in the Bill was not in the agreed form; and he would like to know whether the Company had had any negotiations with the Alkali Manufacturers' Association.

Sir *Joseph Bellamy* said that many gas companies had tar-works [Mr. MOON: But not other people's tar-works]; and so far as the Alkali Manufacturers' Association were concerned, they had no works in Devon or Cornwall. He had been in negotiation with the Tar Distillers' Association, and had satisfied them, although at one time this Association threatened to oppose the Bill. The Company were limited by the Bill to Devon and Cornwall.

Mr. CRIPPS said it was understood from the Tar Distillers' Association that the Alkali Manufacturers' Association, as distinct from the Tar Distillers' Association, had no interest in the matter; and the fact that they did not oppose the Bill showed this to be the case.

The CHAIRMAN said it must not be put in that way, because he had received a communication from the Alkali Manufacturers' Association stating that they had refrained from opposing the Bill in the circumstances of the war, but that they relied upon the Committee not to permit any departure from precedent.

Mr. CRIPPS said that the Alkali Manufacturers' Association had had the usual opportunity of opposing the Bill, when their interest in the matter could have been tested. He understood that they had no interest in the district concerned, and they had not petitioned against the Bill.

Mr. MOON said it was not a matter of a particular district, because tar from Devon and Cornwall could be sent to the works of the Alkali Manufacturers' Association in other parts of the country.

After a little further discussion,

The CHAIRMAN said the Committee thought, on the merits, the proposal with regard to existing and new debentures was justifiable.

The Bill will, therefore, be sent forward for third reading, subject to the point as to the debenture redemption fund.

UXBRIDGE GAS BILL.

In explaining the objects of this measure before the Unopposed Bills Committee of the House of Commons, presided over by Mr. WHITLEY, last Thursday,

Mr. A. J. LEES (Parliamentary Agent) said that the proposal was to purchase the undertaking of the Eton Gas Company, which had a small works close to Eton College. The purchase terms were the issue of Uxbridge stock of an amount which would yield the dividend that had for many years been paid by the Eton Company. Thus, while the Eton shareholder would get no increase in dividend by the change, he got a very much better security in the preference stock of the larger Company. The consumers in Eton, on the other hand, would benefit by the arrangement. At the present time, the price of gas in Eton was 4s. 3d. per 1000 cubic feet; and before the war it was 3s. 4d. in Uxbridge. The latter price had now been raised to 3s. 8d.; but it was still 7d. below the price which the Eton Company charged. At the same time, had the Eton Company continued as a separate undertaking, the price would have had to be raised at least 6d. —making their price 4s. 9d. The arrangement made under the Bill, which had been approved by the Eton Urban District Council and the Eton Rural District Council, was that for five years after the transfer the Uxbridge Company must not charge in the Eton limits more than 6d. above the Uxbridge prices. Thus, the charge in Eton would be 4s 2d. immediately on transfer, instead of the existing price of 4s. 3d.; but at the end of five years, the price was not to exceed an extra 4d. in Eton compared with Uxbridge. So that at the end of five years, Eton consumers would get gas very much more cheaply than they were receiving it at present.

Mr. MOON, K.C. (Speaker's Counsel), raised certain questions as to clause 31, dealing with the issue of capital.

Mr. LEES said the Bill enabled the Uxbridge Company to apply its capital for the purposes of the Eton undertaking; but the Treasury had expressed the opinion that no Uxbridge capital should during the war be spent on the Eton undertaking without the consent of the Treasury, and the clause had been worded giving effect to this. The opinion of Mr. Gray, Counsel to the Lord Chairman, however, was that the payment to the Eton Company of shares by way of purchase was not raising capital.

Mr. MOON quite agreed with this.

Mr. *Harry E. Jones*, the Chairman of the Uxbridge Company, having given evidence in support of the preamble,

The Bill was ordered to be reported for third reading.

GAS PROVISIONAL ORDERS BILL.

The Unopposed Bills Committee of the House of Commons last Thursday sent this Provisional Order Confirmation Bill forward for third reading. It deals with the Fleetwood and Long Eaton Gas Companies' undertakings. In regard to the first, it increases the interest on mortgages from 4 per cent. to 5 per cent.; and as to the second, it authorizes gas manufacture upon certain lands described.

WAKEFIELD CORPORATION BILL.

The Unopposed Bills Committee of the House of Commons last Thursday sent this Bill forward for third reading.

Mr. GIBBON PRITCHARD (Messrs. Sharpe, Pritchard, and Co., Parliamentary Agents), said the main object of the Bill was to sanction certain new water-works in substitution for works already authorized. The capital powers of £150,000, as sanctioned, remained unaltered; the object being to develop a better scheme than that for which powers now exist. It was indeed a more economical scheme. The old one would cost, at present prices, £52,000 more than the original estimates. At the same time it was necessary to proceed with the work at once.

Mr. *Clemesha Smith*, the Water Engineer to the City of Wakefield, said the new works were proposed to be constructed in three sections. The first would yield approximately half-a-million gallons, would cost £25,000, and should be completed in about 2½ years. The second instalment would also yield half-a-million gallons, and would cost £118,000. The Corporation were urgently in need of additional water; and if the present rate of increase in consumption continued, it would be necessary to commence the second section of the work, which would take five or six years, soon after the first section was put in hand.

The CHAIRMAN said it seemed a modest scheme; but the Committee could not complain in present circumstances.

Some discussion then took place with regard to the period for the repayment of the loan of £8000 for reinforced concrete pipes. The Bill asked for 60 years—the same as for the reservoirs.

Mr. MOON, K.C. (Speaker's Counsel), asked what was the life of a reinforced concrete pipe.

Mr. *Smith* said there had only been 15 or 20 years' experience—not long enough to form a definite judgment. So far as his experience went, reinforced concrete work improved with age. There was no reason to believe that ferro-concrete work would not be as durable as masonry. It was all a question of materials and workmanship. In the present case the pipes, which were 42 inches diameter, would be underground.

The CHAIRMAN said that, as the amount involved was very small, the Committee would allow 60 years, as in the case of the reservoirs.

The Bill was then ordered to be reported for third reading.

Fletcher, Russell, and Co., Limited.

The twenty-fourth annual meeting of the Company was held last week, at Warrington—Mr. Thomas W. Fletcher presiding. The Chairman said the shareholders might consider the results of the year's working satisfactory, having regard to the abnormal conditions of the time. Though a larger business had been done than in the previous year, there had been a decrease in the ordinary trade of the Company, which had, however, been more than made up by other special work. Nearly 250 employees had joined His Majesty's Forces. Trade with the Colonies had been much hampered owing to the war, and there had been a decrease in the colonial business in consequence of this. The Continental trade had fallen off considerably; and what business they were doing with neutral countries was most difficult to deal with owing to the crisis. The report was adopted. The dividend on the ordinary shares for the year is 5 per cent., and a bonus of 5 per cent.

War Bonus or a Permanent Increase.—The Municipal Employees' Association have requested the Rochdale Gas Committee to convert the war bonus to lamplighters into a permanent increase of wages. The matter was considered at the last meeting of the Gas Committee; and they decided that they could not accede to the request. But they propose that the bonus, which would otherwise expire at the end of the financial year, be continued until March 31, 1917, or to the close of the war, if that comes about earlier.

Nottingham Gas-Workers' Wages.—In common with other municipalities, the Nottingham Corporation have been confronted with demands from various sections of the employees for an increase of remuneration in the shape of permanent pay or war bonuses. In some directions substantial advances are recommended; but having regard to concessions previously made, it is felt that the case of workmen in the Gas Department stands upon a different footing, and that, in view of the present serious strain upon the Committee's resources, a further raising of emolument in this branch cannot be lightly undertaken. Failing a settlement, it has been determined to refer the men's request to the arbitration of Sir George Askwith, who will have the advantage of being able to weigh some very formidable figures as to the present greatly enhanced cost of production.

MISCELLANEOUS NEWS.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

Half-Yearly Meeting.

The Half-Yearly General Meeting of the Alliance and Dublin Consumers' Gas Company was held at the offices, D'Olier Street, Dublin, last Thursday—Mr. JOHN MURPHY (the Chairman) presiding.

Mr. W. J. GREY, the Secretary and Accountant, read the notice convening the meeting, and also the reports of the Directors—see "JOURNAL" for March 21, p. 645—and Auditors.

CHAIRMAN'S STATEMENT.

The CHAIRMAN, in moving the adoption of the report and statement of accounts, said he was glad to be able to call attention to, and emphasize, the satisfactory nature of the figures submitted for consideration, and to again congratulate the shareholders on the steadily maintained and increasing improvement in the affairs of the Company. The six months with which they were dealing covered a period of exceptional anxiety, and required, especially as regarded the difficulties respecting coal and transport, the closest attention to the conduct of the Company's business in every department. When these matters were taken into consideration, he thought that their being in the position (without increasing the price of gas), after payment of some expectional items, to which he would refer later, to recommend the payment of the maximum statutory dividend and carry forward a considerably larger sum than that brought into the accounts from the previous half year, must be considered a very satisfactory result of the working for the second half of 1915.

THE ACCOUNTS.

Fortunately, the accounts did not require that he should deal with them in detail, as the result spoke for itself; but he would draw attention to certain items which he wished to bring especially under notice. The total expenditure on capital account for the half year amounted to £5651, which included an item of £635, the balance of the cost of the new coal handling plant. The expenditure this half year on new mains and service pipes amounted to £2474. The greater part of this had been incurred in laying new mains on the Leinster Road, Rathmines, and on the Milltown Road, leading to Dundrum, the result of which had been to substantially improve the gas supply to each of the districts concerned. Again, this half year there were three deductions from capital expenditure, amounting in all to £10,672. The net result was that capital expenditure had been reduced during the half year by £5020, and, of course, the balance of capital account over-expended had been reduced by a like sum.

PROFIT DECREASE EXPLAINED.

It would be observed, on turning to the revenue account, that the profit for the half year showed a decrease compared with the corresponding half year of £7871; but, as mentioned in the report, two exceptional items had been deducted on this occasion—namely, £4500 and £2174, being capital adjustments in connection with the sale of old gasholder columns and the sale of old wet meters. There was also the resumption of the half-yearly contribution of £1000 to the officers' superannuation fund, making a total of £7674. If, therefore, this figure was added to the profit, it would amount to approximately the same amount as on the last occasion. The expenditure on coal and oil showed an increase of nearly £12,500; but against this there was an increase of nearly £15,000 in the revenue obtained from coke and breeze, and also an increase of £2800 in the receipts for tar. It was satisfactory to note that purification, instead of involving a charge on revenue, had resulted, on this occasion, in a credit. The fact that they had made a profit was not due to any unusual benefit accruing from the high prices ruling for spent oxide, but to the more efficient arrangements made in connection with the purification plant, and to the adoption of revivification *in situ*. There was a substantial increase in the charge for repairs to works, amounting to £7873; the sum of £4500 was accounted for by the capital adjustments in connection with the sale of old gasholder columns and guide-framing, previously referred to, and the balance in connection with the renewal of station governors and resetting of retorts, &c.

DISTRIBUTION AND MANAGEMENT.

The total expenditure on distribution, after deducting the sales of gas-fittings, amounted during the half year to £18,975. This figure was almost identical with that of the corresponding six months. The expenditure on public lamps amounted to £223, as against £769, or a decrease of £546. The cost of management showed an increase of £1283, occasioned by the additional remuneration voted to the Directors at the last meeting. On the credit side of the revenue account, while considerably increased prices had been obtained in the receipts for residual products, there was a decrease in the sale of gas to ordinary consumers for the half year of nearly £1000, and also a decrease in the receipts for public lighting of £455. It was gratifying, however, to point out that the income from the sales of gas to prepayment consumers again showed an increase—amounting on this occasion to £613. The sum allowed for discount showed an increase over the corresponding period of £1842. The Directors had, however, considered it advisable to increase the reserve under this head by the provision of a further £1250; and this practically accounted for the difference. The surplus received from prepayment consumers for rental of meters and stoves showed an increase of upwards of £900—almost entirely brought about by better collecting, resulting in a reduction of robberies and shortages from meters. Passing on to the net revenue account, it was satisfactory to note that the interest payable to the banks in respect of overdrafts has been reduced from £1694 in the corresponding half year to £912, or a saving of £782.

AN INCOME-TAX ITEM.

It would be necessary for him to explain briefly the income-tax item appearing on the credit side of the account and amounting to £4243. The Directors were advised that advantages would be gained by adopting a scheme mutually agreed upon between certain gas undertakings and the Inland Revenue authorities for determining income-tax allowances in respect of plant, meters, services, fittings, &c. A claim covering three years was accordingly prepared, which, however, on technical grounds, could not be allowed; but a compromise was arranged whereby certain additional allowances were granted in respect of the 1914-15 assessment, the final result being that the assessment, as amended, was reduced from £81,543 to £14,670.

THE BALANCE-SHEET.

Referring to the balance-sheet, the three items—bills payable, bank overdrafts, and sundry creditors—amounted at Dec. 31, 1914, to £98,855; whereas the corresponding items this half year amounted to £72,384—a decrease of £26,471. Turning to the assets side of the balance-sheet, the stocks on hand showed an increase of £7246, and the accounts due to the Company were about the same as in the corresponding period.

WORKS.

As regarded the works, he was happy to be in a position again to state that the buildings and plant at the works had been maintained in good repair and efficiency. They had again placed the contract for the repairs and renewals of the retort-settings with Messrs. Drakes, of Halifax. The cost both of wages and material had greatly increased, But this work was absolutely necessary; and, whatever the expense might be, it must be carried out completely and well. The make of gas per ton of coal was not as satisfactory as they would wish; but, in common with many other undertakings, difficulty had been experienced in obtaining coal supplies, and the quality of some they had received was not up to the standard. The unaccounted-for gas, amounting to 13·49 per cent., was still an unsatisfactory feature; but he was hopeful that the endeavours the Distribution Committee were making would, in due course, bear fruit. An application for an all-round increase in wages, to which the Company made concessions, eventually resulted in a settlement. The Board realized that the higher cost of living necessitated the course taken.

FLOODING AT KINGSTOWN.

He could not very well let pass without comment the flooding of the Kingstown Works on Nov. 12, during a storm of unexampled severity. Several thousand tons of water entered the works, extinguishing the fires in the retort-house and flooding the works to a depth of 5 feet. Had it not been for the efforts of the staff, and the help of the Dublin Fire Brigade—which he took this opportunity of publicly acknowledging—it would not have been possible to have resumed the supply early in the afternoon of the following day. Although the occurrence was unprecedented in the history of the works—and he trusted it might never happen again—the Directors were considering the recommendations of the Engineer in the matter.

THE SHOW-ROOMS.

The work in connection with the new show-room was not progressing so rapidly as they could wish, on account of the existing abnormal conditions; but it was being pressed forward, and they hoped before long to have it completed. Meanwhile, the new show-room at Kingstown had been opened, with satisfactory results.

Mr. DICKENS, in seconding, said he desired to associate himself with all that the Chairman had said. Especially would he like to emphasize his remarks that the six months with which they were dealing covered a period of exceptional anxiety. When they remembered that practically all their supplies, of every description, were sea-borne, only those who were in close touch with the freight markets would realize the very great difficulties with which they had had to contend. Added to this, there was the problem of securing adequate supplies of coal of the proper quality. Another matter to which the Chairman referred, and which had received the very close attention of the Directors, was the unaccounted-for gas, which was undoubtedly high. It had been attributed in the past to various reasons—the unusually long mileage of mains, to some of the pipes being old and leaky, to defective meters, &c. They were gradually narrowing their field of practical inquiry and test, and sooner or later they hoped to be able to put their finger on the weak spot and remedy it. Attention had been called by the Chairman to the falling-off in receipts from gas sold. He was glad to say the consumption of gas so far this half year showed a satisfactory increase, in spite of the fact that they had cut off during the past nine months about 2500 slot consumers. The reason for this was that the individual consumption in each case was so small as to be unremunerative, and, consequently, the Directors decided that the meters, cookers, &c., could be utilized to much better account elsewhere. Before leaving the report, he wished to bring under notice what he considered to be a very satisfactory feature—viz., the reduction in the sum overspent on capital. On Dec. 31, 1913, the amount was £68,411; on Dec. 31, 1914, it had fallen to £50,763; at the end of last year, it was only £45,925; and he expected to see it still further reduced in the near future, and finally disappear altogether. On the last occasion on which he had the privilege of addressing them, he made the statement that he felt sure there were in Dublin quite a number of industries where gas as a motive power could be used to advantage. Some time ago they commenced a special campaign in this direction, and, he was glad to be able to report, with great success; and they were still following the matter up. He was informed that there were quite a number of prospective consumers who hesitated to make the change and adopt gas for power purposes. What these gentlemen said was: "We admit the quality of the gas is good, that the supply and pressure are all that can be desired, and that, all things considered, the price to-day is very reasonable. But what about to-morrow? Supposing we introduce gas for power, for the purposes of our business, what guarantee have we that the price will not be advanced 6d. or 8d. per 1000 cubic feet, as has been the case in practically all other undertakings?" What he (Mr. Dickens) wanted to say in reply was: "You have no guarantee; but one thing we can promise, and that is that no effort will be spared to avoid an increase." He trusted, therefore, that what he had said on this subject would remove any misgivings that might exist. When he joined the Board two years ago it was his hope that within three years the Company would be able

to reduce the price considerably, which would permit of the payment of a higher dividend. Though the war had deferred that hope, he still looked forward to its being some day fulfilled. They would, no doubt, have noticed that their revenue from residuals had considerably increased, and they were leaving no stone unturned to develop this end of their business.

The motion was then put and carried unanimously.

THE DIVIDEND.

On the motion of the CHAIRMAN, seconded by Mr. SCALLAN, a dividend of £5 2s. 6d. per cent. per annum on the consolidated ordinary stock was declared, payable on and after April 10.

THE RE-ELECTION OF DIRECTORS AND AUDITOR.

The re-election of the retiring Directors, Messrs. Dickens and Davies, was agreed to; and Mr. Francis M'Bride was re-elected as Auditor.

Mr. DAVIES, in returning thanks on behalf of Mr. Dickens and himself, alluded to the complete harmony that prevailed at the Board, and to the great trouble and care that were taken in relation to the Company's affairs. This was a matter, he thought, of special congratulation at a time such as that through which they were passing. It was a pleasure to know that the shareholders approved of the working of the undertaking and of the results which had been achieved. He could assure them that no effort would be spared—he was sure he could speak for all the Directors as well as for Mr. Dickens and himself—to do everything possible to promote the interests of the Company and to maintain the working in a state of absolute efficiency.

REDUCED DIRECTORATE.

The CHAIRMAN moved that the resolution of March 31, 1914, fixing the number of Directors at eight, be rescinded, and that the number in future be six.

Mr. A. BOND seconded the motion, which was passed.

VOTE OF THANKS.

The CHAIRMAN, replying to a vote of thanks to the Directors and staffs, and to himself for his conduct in the chair, which had been moved by Mr. Kelly, said he should like to have made a longer reference to the services of Messrs. Grey and Newbigging in connection with the Kingstown flooding; but these gentlemen were very modest, and did not wish that they should attain any prominence in the matter. It was only right, however, he should pay tribute to them for their work in this regard—they were indeed under a deep debt of gratitude to them.

BRITISH GAS LIGHT COMPANY, LIMITED.

The Half-Yearly General Meeting of the Company was held last Wednesday, at the London Offices, No. 11, George Yard, E.C.—Mr. R. S. GARDINER in the chair.

The SECRETARY (Mr. A. W. Brookes) read the notice convening the meeting, the report of the Directors, and the Auditors' reports. The report of the Directors was as follows:

The Directors submit the half-yearly accounts to Dec. 31 last, as examined and certified by the Auditors, who have also vouched for the correctness of the investments held by the Company.

The available profit is £34,175 15s., after deducting the following sums (omitting shillings and pence): Income-tax, £5379; Hull debenture interest, £1884; Norwich debenture interest, £1582; Potteries debenture interest, £586; Trowbridge debenture interest, £146; and interest on debenture stock, £2010—total, £11,589.

HULL.—The gas-rental shows an increase of £400, as compared with the corresponding period of 1914; the price of gas being 2s. 1d. per 1000 cubic feet, as against 1s. 10d. Coke shows an increase of £8570; tar and tar distilling, £487; and ammoniacal liquor and sulphate of ammonia, £644. Coals have cost 18s. per ton, as against 15s. 5d. Coke has realized 14s. 10d. per ton, as against 9s. 2d. The gas sold shows a decrease of 99,375,391 cubic feet, equal to 13·08 per cent. The quantity supplied in bulk to the Corporation for the supply of the Old Town was 33,602,000 cubic feet; being 5,429,000 cubic feet less than in the same period of 1914. The profit, after writing-off £1000 on account of the reconstruction of No. 3 retort-house, is £9120 less than the parliamentary interest. This deficiency will be drawn from the reserve fund; and the sum of £3267 having been written-off this fund for depreciation, the balance remaining is £1953.

NORWICH.—The gas-rental shows an increase of £4784, as compared with the corresponding period of 1914; the price of gas being 3s., as against 2s. 10d., both prices being subject to reductions for gas used for manufacturing and other purposes. Coke shows an increase of £3657; and tar, tar distilling, and ammoniacal liquor an increase of £252. Coals have cost 24s. 3d. per ton, as against 18s. 11d.; and coke has realized 21s. 1d. per ton, against 15s. 4d. The gas sold shows an increase of 20,247,220 cubic feet, equal to 7·59 per cent. The profit realized is £4322 in excess of the parliamentary interest.

POTTERIES.—The gas-rental shows an increase of £3354, as compared with that of the corresponding period of 1914; the price of gas to ordinary consumers being 3s. per 1000 cubic feet, as against 2s. 6d., both with a rebate of 3d. for prompt payment, and the price to prepayment consumers 2s. 8d., against 2s. 3d. Special discounts to large consumers and to consumers of gas for power purposes are also allowed. Coke shows an increase of £2340; tar a decrease of £453; and ammoniacal liquor and sulphate of ammonia, an increase of £410. Coals have cost 17s. 4d. per ton, as against 13s. 3d. Coke has realized 12s. 10d. per ton, as against 9s. 9d. The gas sold shows a decrease of 96,645 cubic feet, equal to 0 05 per cent. The profit realized is £1329 less than the parliamentary interest.

TROWBRIDGE.—The gas-rental shows an increase of £787, as compared with that of the corresponding period of 1914; the price of gas having been 3s. 5d. per 1000 cubic feet, against 3s. per 1000 cubic feet, both with discounts according to consumption. Residual products show an increase of £344. Coals have cost 22s. 9d. per ton, as against 18s. 2d. Coke has realized 18s. 11d. per ton, as against 12s. 7d. The gas sold shows a decrease of 130,640 cubic feet, equal to 0·32 per cent. The profit realized is £75 less than the parliamentary interest.

HOLYWELL.—The gas-rental shows an increase of £162; the prices of gas having ranged from 4s. 8d. to 3s. 1d. per 1000 cubic feet, as compared with 4s. 2d. to 2s. 8d. Residual products show an increase of £66. The profit realized is £499.

The available profit, added to the previous balance of profit and loss, amounts to £112,716. From this sum the Directors recommend a dividend at the rate of 10 per cent. per annum, with a bonus of 2s. 6d. per share, both less income-tax. The dividend and bonus will amount to £26,853, and leave a balance of £85,863.

THE ABSENCE OF SIR CORBET WOODALL.

The CHAIRMAN said he rose to move—"That the report and accounts, as read, be received, adopted, and entered on the minutes." At the request of his colleagues, he was presiding in the unavoidable, and, he believed, unprecedented, absence of their Chairman, Sir Corbet Woodall. In the course of his long and distinguished career, their Chairman's absences had been very few and far between. But the stress of the last twelve months upon all those at the head of gas undertakings, and the difficulties and intense anxieties, had been such that it was no wonder Sir Corbet was at the present moment somewhat unwell, and that he had reluctantly yielded to the request of his medical adviser and his family to take a short rest. He (Mr. Gardiner) was sure the shareholders, both absent and present, would join in sharing the fervent wish of the Directors that their Chairman might very speedily be restored to his usual good health and vigour, and that they might have the pleasure of welcoming him at their next half-yearly meeting in his accustomed place. [Hear, hear.] He would shortly be leaving for the South of England, where he hoped to spend a few weeks. Sir Corbet, notwithstanding his indisposition, had taken the trouble to commit to paper the remarks that he had in his mind to address to the shareholders on this occasion; and therefore he (Mr. Gardiner) could not do better than ask the Secretary to read them to the shareholders.

The SECRETARY read the notes of Sir CORBET WOODALL as follows:

GENERAL FINANCIAL RESULT.

I desire to offer my apologies to the shareholders for my absence on this occasion, and much regret that I am prevented through illness from attending the meeting. Had I been able to be present, it was my intention, when proposing the adoption of the report and accounts, to make the following observations upon the half-year's working: The accounts submitted and the dividend recommended must, in view of the circumstances of the half year, be regarded as satisfactory. Although the cost of coal has been very much higher than in the half year to December, 1914, and the sales of gas have been less by 6¼ per cent., the total profit earned at the five stations has (owing principally to the increases made in the price of gas) amounted to £6000 more—namely, £36,000. After withdrawing £9120 from the Hull reserve fund, and providing debenture interest and income-tax, the available profit is £34,175. The proposed dividend and bonus will amount to £26,853, and leave an addition to the balance of profit and loss of £7322.

HULL STATION.

At the meeting last September, the shareholders were informed how, in the year 1912, it had been found necessary to reconstruct and enlarge the works, in order to provide for the continually increasing consumption of gas, which at that time amounted to nearly 10 per cent. in excess of that of the previous year. In 1913, a further increase of 3 per cent. was experienced; but in 1914, dating from the commencement of the war, the sales of gas, for the first time in nine years, showed a falling-off. In the half year to December, 1914, the sales were less by 2¾ per cent., as compared with 1913. In the half year to June, 1915, the decrease was 5½ per cent., and in the half year to December, 1915, it amounted to 13 per cent. Comparing the sales for the December half year, 1915, with those for December, 1913, the falling-off is as much as 15½ per cent. Looking back twenty years, only once before has a decrease occurred—namely, 1 per cent. in the year to June, 1905. The alteration and enlargement of the works cost £86,000, of which £55,000 was appropriated to capital account, and £31,000 to revenue. Of the latter sum, £24,000 has been charged against the profits of the past four years; and it is proposed to write-off the remaining £7000 at the rate of £2000 per annum. In addition to this exceptional charge of £24,000 against revenue, the cost of all materials and labour has considerably increased, and the granting of war bonuses and allowances to dependants of men on service has also added to our expenses. But there has been another serious difficulty—namely, that the prices yielded for residual products have not advanced with the increased cost of coal; and, in this respect, Hull has been particularly handicapped in the disposal of coke. As an illustration: Whereas in the year 1912, we recovered at Hull in residuals 80 per cent. of the cost of coal, in the year 1915 the percentage was only 55. With these additional expenses, it follows that the cost of production per 1000 cubic feet must rise; and this cost has been further swelled since the war by the serious falling-off in the sales of gas. The additions to capital automatically increase the interest authorized by Parliament, which in the last half year amounted to £20,800, or £3200 more, as compared with four years ago. The charge for interest per 1000 cubic feet sold is, of course, also larger by reason of the reduced output. The effect of all these increased charges is that the net cost of gas and parliamentary interest has increased by 7d. per 1000 cubic feet sold, or from 1s. 9d. to 2s. 4d. The price of gas was advanced last April from 1s. 10d. to 2s. 1d., and a further increase to 2s. 4d. has been announced to take effect next month. It is felt by the Directors that, if the consumption of gas continues to fall, this further advance in price will not be adequate to meet the continually increasing cost of production and distribution. But, in arriving at their decision, they have been actuated by the desire to maintain their policy of supplying cheap gas; nor do they consider that the present is a time when they should ask their consumers to bear the whole burden of increased costs consequent upon the war. Owing to the situation of the city, lighting restrictions have been very rigidly enforced. There have been so many prosecutions that some people are afraid to light their gas; and, even when their windows are well screened, they are content to work with a shaded candle. Of course, shop lighting is reduced to a minimum, and most of the shops close soon after sunset. Although the decreased consumption last half year was 13 per cent., I notice that some East Coast towns have been greater sufferers in respect of reduced sales. In one case, the decrease over the whole year amounted to 26 per cent., and in another to upwards of 20 per cent.; and, in the latter case, the profit was about half that of the previous year, and it was decided to declare no dividend. As to the Hull reserve fund, four years ago this

stood at £47,180, and is now only £1953; the reduction being mainly due to the withdrawal of £40,291 to make up deficiencies of earnings in that period—the remainder being accounted for by the writing-down of the value of the investment. At the end of the current half year, the reserve fund will disappear (it is hoped only temporarily); but it should be remembered that this fund, which was built up in past years, consisted entirely of profits made in excess of those authorized by Parliament, and put by in order to be of assistance in less flourishing times. The fund has, therefore, up to the present, fulfilled its purpose of enabling the Company to bring into its general profit and loss account every penny of interest authorized by Parliament. And, although the reserve fund may have gone, it should also be remembered that it has not been necessary to use it all to pay the shareholders' dividend. As a fact, the amount withdrawn in the year 1915 was £14,013; but, as only £1767 of this sum was required for the purpose of dividend, the effect on the year's accounts has been to transfer £12,246 from the Hull reserve fund to the balance standing to the credit of profit and loss. The Directors are not disheartened with the condition of affairs in Hull. They are aware of the difficulties which have of late beset the station; and they look forward with confidence to the future. The Engineer has always been watchful of capital expenditure; and the falling-off in business could not be anticipated when the extensions were determined upon. Under the excellent administration of Mr. John Young, the station has for many years maintained the Company's high reputation; and the Hull Corporation will assuredly bear in mind that the Company have always supplied gas at the lowest possible price. For the next year or two at Hull, it may be necessary to be content with less than the full profit authorized by Parliament, and to rely upon recovering deficiencies in more prosperous times. That this is a matter which can be viewed complacently can perhaps best be evidenced by reference to the

NORWICH STATION.

Some years ago this station fell upon bad times, and, with no reserve fund upon which to draw, the deficiencies of profit accumulated until, at the end of the year 1902, they amounted to £42,437. About this time, it was found necessary to entirely reconstruct the works; and the major portion of the cost (some £44,000) had to be charged against revenue. This burden has been disposed of; and the station has for some time been earning not only its full parliamentary interest, but, in addition, some of the deficiencies of past years—the result being that the indebtedness of the station has been reduced by £8130. The results of the past half year at Norwich have been very satisfactory; and, up to the present, the increase in the price of gas of 2d. per 1000 cubic feet, which dated from July 1 last, has proved sufficient. Though lighting restrictions have been very stringent, the sales of gas have increased by 7½ per cent. Of course, the station suffered no loss in public lighting, as a year or two ago this was practically all taken over by the Corporation electricity undertaking. The increased output is attributable to, among other sources, the extensive use of gas for hot-water supplies, cooking, &c. Although the increased sales have been well maintained, the financial results of the current half year will probably not be equal to those of the half year just passed, as the station has not yet felt the full effects of the increased cost of coal and oil, and of delivery to the works.

POTTERIES STATION.

In the half year ended December, 1914, owing to exceptional expenses in repairing the Tunstall works and in effecting improvements at offices and show-rooms, the profit earned was a very poor one. A comparison with December, 1915, therefore serves no purpose; but it is sufficient to mention that the profit last half year was over £6000, whereas a year ago it was less than £2000. A satisfactory feature is that, though coal cost more by £3400, the yield from coke improved by £2300.

TROWBRIDGE AND HOLYWELL STATIONS.

The profit at these stations has been well maintained; and here, also, a considerable portion of the increased cost of coal has been recovered in sales of coke.

MISCELLANEOUS POINTS.

With regard to one or two matters referred to at the last meeting, the 72 shares offered to the shareholders have been allotted—thus completing the issue of 2000 shares. The Company have been met very fairly under the Price of Coal (Limitation) Act by its several contractors; and the allowances upon contracts entered into before the passing of the Act have amounted to £3000. The number of employees serving in H.M. Forces is now 297. It will be noticed from the balance-sheet that the investment in Consols, relating to the premises in George Yard, has been converted into 4½ per cent. War Stock. The result in interest is a small gain of £14 per annum.

Mr. FREDERICK WILKIN seconded the motion.

AIR RAIDS.

Mr. CHARLES WEBB asked whether the Company had met with any damage by air raids at any of the stations, and whether the works were insured against war risks.

The CHAIRMAN said they had been exceedingly fortunate. At only one of the stations had any damage resulted; and this was limited to the fracture of a 3-inch main. With regard to the insurance of the works against damage from air-craft, the Board went into the matter very carefully in the autumn of 1914, and ever since the works had been adequately insured. The shareholders might rest assured that the Directors were fully alive to the desirability of protecting the Company from financial loss in case of damage.

The motion was unanimously carried.

THE DIVIDEND.

On the proposition of the CHAIRMAN, seconded by Major-General W. T. CORRIE, the dividend and bonus mentioned in the report were declared.

Mr. HENRY PULLMAN said he desired to express, on behalf of himself and his fellow-shareholders, regret at the enforced absence of their Chairman, Sir Corbet Woodall, and to heartily desire that he might be speedily restored to health, and take his usual place among them at their meetings. He also wished to be allowed to express heartfelt gratitude to the Chairman and his colleagues for the excellent balance-sheet presented that day. They were deeply grateful for the efforts the Board had made during what had been most arduous and irksome times.

Mr. KENNETH R. MACKAY seconded the proposition, which was cordially agreed to.

CASUALTIES AT THE FRONT.—VOTES OF THANKS.

The CHAIRMAN, in thanking the shareholders for their vote, said his colleagues and himself would miss Sir Corbet Woodall very much. They were also "short-handed" owing to the continued absence of their colleague Mr. Harold Palmer, who had now a commission in the Royal Engineers, and was at the front on the Continent. However, the rest of the members of the Board would do their utmost to protect the interests of the shareholders in every way. In the absence of Sir Corbet, Mr. Wilkin or himself would always be at hand to give the Secretary any assistance or advice he might require of them. He would now propose what was not the least important resolution put before the shareholders that day. It was a vote of thanks to the Secretary, the Managers at the different stations, and their staffs. Each succeeding half year in these critical times seemed to add to the difficulties of gas managers. They had heard from the report that 297 of the members of the Company's staffs had joined the King's Forces. It might interest the shareholders to know that eight had been killed; and he grieved to say that among them was the eldest son of their Manager at Norwich, Mr. Thomas Glover, who was a young man who had just completed most successful studies and was embarking on what seemed to everyone to be a very promising career. The Board grieved very sincerely with his father in his great loss. Apart from the eight killed, two had been drowned, one was killed while training in England, one was a prisoner in Germany, and one was a prisoner in Turkey. But shortage of labour was only one of the many troubles with which gas managers had to contend at the present moment. There was the greatest difficulty in obtaining an adequate supply of coal and oil; and when these had been obtained, difficulties of transport were almost as great. He read in a newspaper last week that a man at Hull had been fined 17s. 6d. for lighting a match in the street. This incident disclosed a state of affairs that must make it exceedingly difficult for a gas manager—a purveyor of light—to maintain his business. He was happy to say that, notwithstanding all his difficulties, Mr. Young was as brave and cheery as ever, and, as anticipated in the Chairman's notes, he had no doubt that at Hull they would return in due course to their former prosperous condition. At all the Company's stations, with no exceptions, he might say their Managers were fully equal to the demands that had been made upon their energy and resourcefulness; and he thought they should record their sincere appreciation of their efforts, and they, in turn would, he was sure, be the first to acknowledge how greatly indebted they were to their Secretary, Mr. Brookes, whom he could not praise too highly. He gave the closest possible attention to their business. He never spared himself; and it was really due in great degree to his constant watchfulness that they were able to carry on their business so successfully in these difficult times.

Major-General CORRIE seconded the motion, and Mr. PULLMAN very heartily supported it.

The motion was cordially agreed to.

Mr. BROOKES, in responding for his colleagues and himself, said the altered conditions brought about by the war had rendered the lot of a gas engineer anything but an enviable one. He was quite sure the passing of this resolution would be very encouraging to the Engineers at the Company's works. He was pleased to hear from them that the staffs (which, of course, had been very considerably depleted) were all working well, and willingly undertaking the extra duties put upon them. He was glad to testify the same of his assistants at George Yard. As an instance of the spirit of their officials, he might mention that at one of their principal stations, an officer, after many years' service, retired on a pension, and he now insisted upon returning for a few days at those times when he knew there was an exceptional amount of work to be dealt with. It would be a great pleasure to him (the Secretary) to convey this vote of thanks to those concerned; and he knew it would be much appreciated by them as it was by himself most heartily.

COALITE LIMITED.

Board of Directors Completely Changed.

At an Adjourned Ordinary General Meeting of the shareholders of Coalite Limited—held at Salisbury House last Wednesday—the report submitted stated that, since the annual meeting of the Company in December, 1914, the Board of Directors had been completely changed. The accounts presented were for the two years ended Dec. 31 last. Since the issue of the report at the end of 1914, the negotiations of the Company with the British Coalite Company, Limited, for the further development of the coalite process, have been brought to a conclusion, as a result of which this Company will continue to retain the benefit of all improvements and additions covered by the British Coalite interests in respect of all rights outside the United Kingdom. The small test plant erected at Barnsley achieved entirely satisfactory results; and the Barnsley Smokeless Fuel Company, Limited, was formed, with a capital of £95,000, and a subsequent authorized debenture issue of £50,000, for the purpose of erecting a large plant upon a commercial basis. The Treasury have subscribed for £10,000 of the debentures. The work of erection was begun in September last, and would have been completed before now, had it not been for the difficulty of obtaining material and suitable labour, and the exceptionally unfavourable weather conditions throughout the winter. The work, however, has proceeded almost without interruption; and the Consulting Engineer (Mr. Stephen N. Wellington) reports that the plant will be completed and working at an early date.

Mr. H. WILLMOTT (the Chairman) presided, and, in moving the adoption of the report and accounts, began by saying that the Company's assets included holdings in the British Coalite Company, and patents covering the low-temperature carbonization of bituminous

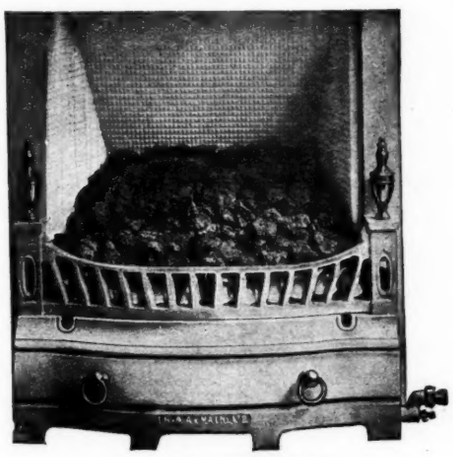
coal. These patents, which numbered twenty-two, covered all important countries. New patents covering the latest constructional improvements had recently been taken out. The British Coalite Company, who had acquired the rights for Great Britain, had formed as a subsidiary company the Barnsley Smokeless Fuel Company, in which the Government had subscribed part of the capital, in addition to giving the Company contracts for the whole of certain bye-products. A plant was being erected in Yorkshire by the Barnsley Company for carbonizing 200 tons of coal per day; and when it was completed, the results showed that the past claims put forward in connection with the coalite process would not only be justified, but that it would yield a return per ton of coal carbonized greatly in excess of the original estimates. The Barnsley Company worked in conjunction with three large local concerns—the Old Silkstone Colliery (from which the coal was obtained), the Yorkshire Electric Power Company (which would take the gas produced by the plant for fuel purposes), and Messrs. Ellison and Co. (who would distil the tar and deal with the residuals). These arrangements covered a long period of years; and the three undertakings were within a few hundred yards of the site upon which the plant was being erected. Everything tended to contribute to ensure for the Barnsley Company unrivalled facilities for demonstrating the commercial value of the coalite patents; while the plant should leave nothing to be desired in the way of excellence and efficiency. The world was their field—particularly those parts of it where coal suitable for low-temperature distillation was to be found. In every country in which there was coal, openings for them should abound. Nor need they be excluded from those countries where coal had to be imported; for everything went to show that the present wasteful and extravagant methods of utilizing coal would be revolutionized once the low-temperature process of distillation had been established on a sound commercial basis. Not only would it be then possible to supply for domestic and industrial consumption an economic substitute for the ordinary house coal, in the shape of coalite; but it would be possible to supply, at a greatly reduced price, a gas equal for power and illuminating purposes to any produced by existing undertakings. Moreover, the residuals obtained from their process yielded per ton of coal carbonized a volume, and had a value, incomparably greater than those derived from the tar produced by other systems of carbonization. According to their technical advisers, at the present moment the main importance of the bye-products from the tar was in the yield of the substances required for the manufacture of high explosives, which was more than twice as great as was obtained by the method of coal distillation adopted by gas and coke-oven companies; while their process, instead of leaving in the retort a hard coke suitable only for very limited use, left the fuel known as coalite. The quantity of coalite obtained from the retorts amounted to some 70 per cent. of the weight of the coal distilled; and it commanded a ready sale at a price exceeding that of house coal. The gas given off amounted on an average to 8500 cubic feet per ton of coal carbonized. It was of a very rich quality, and of a calorific value of over 800 B.Th.U. When the war was over, there would be one industry which this country would have to develop with all speed, and this was the production of aniline dyes. The substances he had alluded to as playing so important a part in war, were no less useful for the peaceful purpose of conversion into dyeing materials. Indeed, it was a rather noteworthy fact that dyers employed one of these substances for many years without having an inkling that they were handling an explosive of the most tremendous force. Low-temperature carbonization of coal had come to stay. Of this, he had not a shadow of a doubt. The great interest being taken in the process had led to inquiries with regard to their foreign rights; and negotiations were proceeding for the sale of the rights for certain foreign countries, on terms which the Board considered satisfactory. There was little doubt that, not only was the country getting awakened at last with regard to the enormous wastage that had been going on for a hundred years or more in connection with the methods of burning coal, but Parliament was also being gradually awakened to the necessity of fuel economy. The day was not far distant when it would be compulsory for the public to use smokeless, and only smokeless, fuel. The Barnsley Company were about to complete their issue of debentures; and these would shortly be offered to the shareholders in this and the British Coalite Company. The debentures would bear interest at the rate of 6 per cent., and would be offered at 90 per cent. They would be redeemed by ten annual drawings of £5000 per annum, commencing in April, 1918, at the price of 105.

The adoption of the report and accounts was formally seconded, and unanimously agreed to without any discussion whatever; and the appointment of all four members of the Board—Mr. Willmott, Mr. W. J. Fisher, J.P., Lieut.-Col. J. F. C. Hamilton, J.P., and Mr. C. E. Peczenik—was ratified, and the Auditors re-elected, in an equally expeditious manner.

Maryborough (Queensland) Gas Company.—The profits for the half year ended Dec. 31 of the Maryborough Gas and Coke Company, Limited, after making provision for bad and doubtful debts, repairs and renewals, depreciation, working expenses, wear and tear, and other charges, and including the balance brought forward, amounted to £1225, from which the Directors, at the recent meeting, recommended the payment of the usual dividend at the rate of 6 per cent. per annum, free of income-tax, leaving £235 to be carried forward.

Wilton Gas-Works Troubles.—There was a long discussion at the last meeting of the Wilton Town Council on the condition of the gas-works, which it was stated had been allowed to get into a faulty condition, with the result that the Medical Officer had reported the gas to be "very impure, the quality bad, and the supply very deficient." The services of Mr. Norton H. Humphrys were requisitioned; and it has been decided to ask him to take the necessary steps to get the works into good order. Mr. Humphrys promptly went into the matter, with such good effect that the Town Clerk was able to announce that the gas was now of good quality, and was pure."

THE MAIN GAS FIRES.



The ST. NICHOLAS.

THE

ST. NICHOLAS—

The Gas Fire without a rival.

The new booklet—"Main Reflections"—contains particulars of several new Gas Fires. Copies free on application.

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WORKS: Gothic Works, EDMONTON, N. Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 83, Old Market Street, BRISTOL; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

TRIBUNALS AND EXEMPTION APPLICATIONS.

An employee of the Newcastle-on-Tyne Gas Company applied for total exemption on religious, political, and moral grounds. He said he believed that life was not the property of man, and to destroy life was not the right of man. As a Socialist, he believed in the universal brotherhood of man; and he could not take or keep the military oath. Applicant was recommended for non-combatant service.

Before the Southwark Tribunal, on Monday of last week, Messrs. Thomas Beggs and Son, engineers, of Southwark Street, applied for the total exemption of an employee engaged as a water-meter repairer and tester. A representative of the firm said the man was the only one left to do this work; and he had been with the firm 21 years, and trained in the business since he was a boy. If the applicant went, there was no one left to do his work; and the firm would have to cancel their contracts. He was granted two months' extension.

Before the Military Service Tribunal, Mr. David Lambie (the Secretary of the Coatbridge Gas Company) appealed on behalf of the Company for the total exemption of a bookkeeper in the office, whose services were said to be indispensable. The Company, it was explained, were supplying material for the making of war munitions; and the staff was already depleted. Although a woman might take up the bookkeeper's work, it would require a considerable time for her to learn it. The Tribunal granted exemption until June 1, when a fresh application will have to be made.

The London Hydraulic Power Company, of Bankside, Southwark, appealed to the Tribunal for the exemption of a filterman, engaged on the work of supplying high-pressure water for power purposes. A letter was read from the Board of Trade, stating that the business of the Company was of national importance; and consequently the employees should be placed in certified occupations. Mr. Harvar, on behalf of the Company, stated that they were training women as drivers and stokers; and he hoped in time to let them take the place of some men who had been given six months' extension, and so release the men for active service. The applicant was placed in certified occupations.

WARMING AND LIGHTING.

Some Views of Dr. Porter.

A lecture was delivered, under the Chadwick Trust, at King's College for Women, Kensington, on Thursday afternoon last, by Dr. Charles Porter (Medical Officer for Marylebone), on the subject of "Heating and Light." It was the third of a series on the domestic arterial system in relation to comfort and health; the two preceding discourses having been on drainage and water supply.

He dealt in the first place with the coal-fire, which, he pointed out, is largely a radiator, though, like most heaters, it is to some extent a convector. Other things being equal, what is generally preferred on grounds of health and comfort, is a heater which will heat mainly by radiation, or, in other words, would not dry the air too much. Coal-fires are comfortable and cheerful; but they are not cleanly. In rooms where heat is required for (say) eight or ten hours a day, the cost is low; but they are not really cheap. They burn more fuel in relation to the heat produced than any other agent. The author advanced the opinion that in blocks of flats heating should be carried out centrally, so that all the tenants could receive a supply of heat and hot water. In fact, in one part of Marylebone, it seems, there is a proposal on foot to build a large block of working-class flats, and to provide each tenant with a supply of hot water. Closed stoves are not greatly in favour in this country, because they heat mainly by convection, need great care in construction, and are rather cheerless.

Open fires for burning gas as fuel, said Dr. Porter, are widely used, and have many advantages over coal fires. They are more convenient, because they begin to give off warmth the very moment they are lighted; they make no dirt; and they do not add to the fog and smoke nuisance. Though, in his opinion, less cheerful than the coal-fire, it is more economical, to the extent that less of the heat which it creates is wasted. The modern types, it is claimed, heat mainly by radiation; and he sees no reason to doubt this. The heat is a fierce and concentrated one. In relation to ventilation, it acts in much the same way as a coal-fire; but if not properly fixed and used, it is likely to add to the contamination of the air from products of combustion. In connection with the gas-fire, it has to be remembered that it is exceedingly easy to use it improperly; and, in the lecturer's opinion, though it is more convenient than the coal-fire, its employment "is associated with greater risk." Electricity was then dealt with; and after weighing-up the advantages and disadvantages of the three systems, Dr. Porter expressed the view that the one "which most deserves the claim of being a hygienic heater is undoubtedly electricity." He urged that, as regards safety, cleanliness, and convenience, it is ahead even of gas, "in favour of which so many claims are advanced." In the matter of cost, so far as electricity is concerned, installation is the great trouble. In connection with lighting, also, the lecturer indicated his preference for electricity, as "the only hygienic artificial lighting agent."

A good deal of attention was given to the kitchen coal-range, which, in these days of gas and electric cookers, and hot-water heaters, it was pointed out might very easily be abolished. To meet the difficulty of providing a fire in the kitchen, there was described and illustrated a design of combined sitting-room fire, cooker, and water-heater.

Geelong Gas Company.—The profit and loss account submitted at the half-yearly meeting of the Company showed a credit of £2371, out of which it was decided to pay a dividend at the rate of 3s. per share, and to carry forward the balance of £871. Subsequently, the shareholders, at the invitation of the Directors, paid a visit to the works at North Geelong, where a new holder is being erected.

Investment

An individual finds his own success in promoting that of the concern he serves.

We seek ours—by the usual commercial expedients, certainly, but none the less, by the work we believe we are doing for GAS.

That the Industry may have at least one concrete and sustained argument for Gas and all its uses, we have included in the Permanent Exhibition at our Oxford Street Salons, much that we are not interested in commercially. . . . And we consider the space well used.

For what we give to GAS, we believe GAS will return to us with interest—in the practical shape of a continuous increase in the demand for everything "DAVIS."

THE DAVIS GAS STOVE CO., LTD., *Gas Exhibition Salons,* 60, OXFORD ST., LONDON, W.

NOTES FROM SCOTLAND.

Shortage of Coal in Edinburgh.—The Edinburgh and Leith Gas Commissioners recently invited tenders for their annual supplies of coal; but instead of receiving offers of over 1,000,000 tons, as was formerly the case, only 10,000 tons were quoted for. The Convener of the Works Committee (Judge Lindsay), in reporting to the Commissioners last week, stated that all suitable coal which had been offered this year had been purchased; but in spite of this, 20,000 tons had been taken from their stores. The collieries from which the Commissioners had for many years obtained their coal had either largely reduced their offers or refrained from quoting. He advised that the Board of Trade should be informed of the rather serious position the Commissioners were in, when action would no doubt be taken to ensure sufficient supplies. Judge Lindsay further remarked that the Government had appointed local committees, whose business it was to see that the gas undertakings in their respective districts secured the coal they required. The matter was left in the hands of a Sub-Committee.

Tramway Cable Cuts a Gas-Main.—The Works Committee of the Edinburgh and Leith Gas Commissioners have reported that one of the gas-mains has been cut through by the friction of the tramway cable, and that a loss of gas had resulted. A conference has been arranged between the Tramway Company and the Works Committee, at which it was hoped that the question of compensation would be satisfactorily disposed of. Considerable annoyance and loss have been caused in Edinburgh during recent months, owing to repeated breakdowns of the cable-car system. In sawing gas-mains, however, the system has discovered a new method of causing trouble and loss.

Revival of the Suggested Suspension of Sinking Funds.—As reported at the time in the "JOURNAL," the Convention of Royal Burghs approached the Secretary for Scotland some months ago on the question of the suspension of sinking funds; commending to his favourable consideration the proposal that corporation gas undertakings in Scotland should be granted temporary relief as regards their contributions to sinking funds. The Edinburgh and Leith Gas Commissioners also addressed a letter to the Scottish Office on the same subject. To both appeals, the Secretary for Scotland turned a deaf ear. The Department had made up its mind; and arguments, be they never so cogent, were unavailing. Dr. W. A. Chapple, M.P., recently took up the cudgels on behalf of the idea, and wrote a letter to the Lord Advocate (who sent it to the Scottish Office), in which he pointed out that the Minister of Munitions had made an urgent demand on all to use gas for every purpose for which it is appropriate, in order that the amount of toluol and benzol required for munitions may be increased; that one way of pushing the use of gas would be to reduce the price of it; and this could be brought about by the temporary suspension of sinking fund obligations. The official reply was to the effect that the Secretary for Scotland had already considered the matter, and was not prepared to adopt the proposal. Undaunted by this rebuff, the gallant doctor has sent the correspondence to the Press, "in the hope that other pressure might be brought to bear on the Secretary for Scotland."

Perth Gas-Workers' Wages.—The reply from the Chief Industrial Commissioner of the Board of Trade containing the remarks of Sheriff Mackenzie, who acted as Arbiter in the gas-workers' wages dispute, has now been received. The communication states that Sheriff Mackenzie gave his award on the return provided him by the Town Council, containing information which led him to assume that an increase of wages had been granted to several of the employees since August, 1914. At the Gas Committee meeting, at which the report was submitted, Lord Provost Scott and ex-Bailie Wright, the Gas Convener, stated that no such information was placed in the hands of the Arbiter. The last increase granted was in January, 1914. On the motion of ex-Bailie Wright, it was unanimously agreed that 2s. increase, as war wages, be granted to all employees in the gas-works who had been in the employment of the Corporation since the outbreak of war. The Convener intimated the receipt of a letter from the Organizing Secretary of the Gas Workers' Union complaining of the delay in giving effect to the Arbiter's award, and stating that unless the increase was granted the matter would be brought before the Munitions Tribunal.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *April* 3.

There is no new feature to report in the London tar products market, except a somewhat increased inquiry for pitch. Some shipments of that product are made regularly. Prices of all products are unchanged.

Sulphate of ammonia is in fair demand; and as export licences are now being granted in approved cases, it is expected that the market will soon become normal. Quotations for this product are also unaltered.

Tar Products in the Provinces.

April 3.

There is nothing fresh to report in the markets for tar products. There is little business doing in pitch. Creosote is still difficult, and sales are not easy to negotiate. Some lower prices are reported to have been accepted for solvent naphtha. Heavy naphtha is in good demand.

The average values of gas-works products during the past week were: Gas-works coal tar, 16s. to 20s. Pitch, East Coast, 15s. to 15s. 6d. per ton; West Coast, 14s. to 14s. 6d. Manchester; 15s. to 15s. 6d. Liverpool; 17s. to 17s. 6d. Clyde. Benzol, 90 per cent., North, 10½d. to 11½d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha,

The Evolution of the Gas Cooker.

Remarkable figures of the work accomplished in our laboratories in the improvement of Gas Cooker efficiencies will be published shortly.

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WARRINGTON AND LONDON.

in bulk, North, 6½d. to 7d. Solvent naphtha, naked, North, 2s. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 2½d. to 2⅝d. Heavy oils, in bulk, 3⅞d. to 4d. Carbolic acid, 60 per cent., East and West Coasts, 3s. 4d. naked. Naphthalene, salts, 80s., bags included. Anthracene, "A" quality, 2d. to 2½d. per unit; "B" quality, nominally ⅜d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *April* 1.

Throughout the week the tone of the market has continued quiet but steady, and once more prices have remained practically on a dead-level. Demand has improved to some extent, but not sufficiently to affect values while supplies are so ample. Quotations for early delivery are repeated at £16 17s. 6d. per ton f.o.b. Hull, £17 f.o.b. Liverpool, and £17 2s. 6d. f.o.b. Leith. It is reported that further transactions have taken place for delivery up to the end of this year at a premium of 5s. to 10s. per ton on prompt values.

Nitrate of Soda.

The market for this article is again firmer on spot, and quotations have now been advanced to 17s. 4½d. per cwt. for ordinary quality, and to 18s. 6d. for refined.

Sulphate of Ammonia.

From another source it is stated that quotations are as follows: Outside London makes, £15 17s. 6d.; Hull, £16 12s. 6d.; Liverpool, £16 15s.; Leith, £16 17s. 6d.; Middlesbrough, £16 15s.

COAL TRADE REPORT.

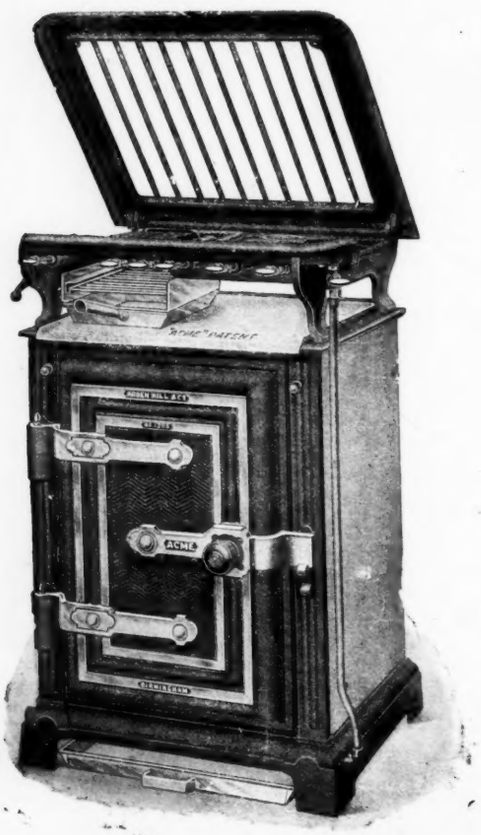
Northern Coal Trade.

The coal trade continues active, and there is a strong demand; but steamers continue scarce, especially in the coasting trades, so that the shipments are rather irregular. Tonnage has, however, been arriving rather better during the last few days. The steam coal trade is brisk; and the increase in the miners' wages by 12 per cent., bringing them up to 90 per cent. above the standard—the highest rate in the history of the trade—must further stiffen prices. At present, best Northumbrian steam coals are from 35s. to 36s. per ton f.o.b.; second-class steams are quoted at 28s. 6d. to 32s. per ton; and steam smalls are 17s. to 21s. per ton. The prices therefore of steam coals are firmer all round, and at high figures, which apply to both prompt and forward deliveries. The output is fairly good in the circumstances. In the gas coal trade, the position is impeded by an occasional lack of ready tonnage, despite the high freights that are offered in the market. Best Durham gas coal is about 25s. 6d. per ton f.o.b.; for second-class gas coal the quotation is near 24s. per ton; and for "Wear Specials" the current price is about 27s. per ton f.o.b., with a fair demand. Freight on gas coal from the Tyne to London has been from 17s. to 17s. 6d.; but the full arrivals of tonnage over the week-end may give ease for a few days. There is a little doing in the arrangement of contracts to replace those that are near expiry, but not much transpires as to the actual figures that are likely to be paid, for possibilities of price of coal and rate of freight are very uncertain for the early future. The output of gas coal seems to be more taken up for export than it has been of late—that is, more to our Allies. There is on the whole a steady tone in the coke market, with exports relatively heavy. Good gas coke is quoted from 26s. to 27s. per ton f.o.b. in the Tyne.

Budleigh Salterton Gas Company.—At the annual meeting of the Company, the report adopted showed a profit of £779; and the Directors recommended a dividend of 5 per cent. They regretted having been compelled to increase the price of gas another 3d. per 1000 cubic feet.

Darlington Gas and Water Profits.—At a recent meeting of the Darlington Corporation Gas Committee, it was reported that the profits for the year would probably be £5000. It was resolved that £3000 should be handed over for the relief of the rates, compared with £4000 last year. The price of gas was raised from 2s. to 2s. 8d. per 1000 cubic feet during the year; but there has been a considerable rise in the cost of fuel, and in the amount of war bonuses. The Water Committee have decided to hand over £6000 to the rates, against £7000 last year. The expenditure has increased, owing to the higher price of fuel, and the advances in wages and rates and taxes. The Committee thought it advisable to keep a sum of money in hand to meet any exceptional outlay. The Streets Committee report a net saving of £5500, which is largely due to restricted lighting.

Wages at Burton-on-Trent.—As the outcome of an application by the Burton Corporation workmen (with the exception of skilled tradesmen, who have their own recognized rates) for an all-round advance of 3s a week in their wages, an arbitration court was held last Wednesday, under the presidency of Mr. W. W. Mackenzie, who was appointed by the Industrial Trial Commission of the Board of Trade. After a lengthy hearing, a settlement was arrived at, by which there is to be paid a war bonus of 2s. per week to men getting up to, and including, 38s. (women temporarily doing men's work to be included); men whose wages are over the amount named for a normal six days' week to be given such a bonus as will bring them up to £2; boys and youths under 21 years to have a war bonus of 1s. per week. The matter is to come up for reconsideration within six months after the termination of the war.



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SOME NOTABLE FEATURES.

Extra large oven.

Hinged and improved hotplate; taps in front; wrought-iron top bars.

Porcelain enamelled inside and out.

Nozzle outlet at back, leaving clear space on top of oven for loose enamelled tray.

All parts are standardized and are not nominally but **actually** interchangeable.

ARDEN HILL & CO.,
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Increased Wages Asked at Bury.—The Municipal Employees' Association have applied to the Lighting and Fire Brigade Committee of the Bury (Lancs.) Corporation for an increase in wages of 1d. per hour, which is equivalent to 4s. per week. The matter has been deferred for the consideration of the whole Council, sitting as the General Purposes Committee. Other increases are asked for by men employed in public utility departments.

Londonderry Gas Company.—Mr. H. J. Cooke (the Chairman), presiding at the annual meeting of the Company, said they were obliged to meet the increased outgoings by an advance in the price of gas, and to ask the shareholders to consent to a reduction in the dividend. There had been a substantial increase in the amount of gas consumed; and the returns on residuals had also been very satisfactory. The report was adopted, and a dividend was declared of 7½ per cent. on the old shares and 5¼ per cent. on the new shares, free of income-tax.

Capital Powers at Staveley.—It was stated by Mr. M. Pattison, when moving the adoption of the report at the annual meeting of the Staveley Gaslight and Coke Company, that though parliamentary powers had been obtained for the extension to Barlborough, it had been impossible to proceed with the work, as the Board of Trade had inserted a clause in the Provisional Order debarring them from raising additional capital or issuing debentures during the period of the war, and for twelve months afterwards, without the sanction of the Treasury. As the Company were already committed to a large amount of capital expenditure, application was made to the Treasury; but permission was refused. Dividends were declared of 10 per cent. on the original shares and of 7 per cent., less tax, on the new shares. A vote of sympathy was passed with Mr. F. Hardwick (the Chairman and Managing-Director), in his long and serious illness.

Gas Matters in Leeds.—Alderman C. H. Wilson, when presenting to the Leeds City Council the municipal budget for the year (showing a reduction in the rates of 1s. 1d. in the pound), remarked that with regard to gas a very satisfactory year had been experienced. The Committee had estimated a profit of £16,000; and it might reach £20,000. This would go towards the reduction of the gas deficit; and if another year like last was experienced, the deficit would disappear altogether. Alderman G. Ratcliffe contended that the Gas Committee ought to be assisted with their deficit. He said in the ten years before the strike, the Committee had provided £200,000 out of revenue. The strike cost them £100,000. What it meant was that the Committee should increase the price of gas to wipe off the deficit. It was recognized that there were great developments in new businesses coming to Leeds; and the tendency of these manufacturers was to use gas in large proportions. One concern at the present time was in negotiation with the department for 2,000,000 cubic feet of gas per day. If they had to charge these people an unreasonable price, they would be immediately put out of court. If the Committee had been fairly dealt with, there would have been no necessity to put up the price of gas as they had had to do in recent times.

Gas Profits at Stockton.—Moving the adoption of a reduced rate at last Friday's meeting of the Stockton-on-Tees Corporation, Mr. F. T. Nattrass said the gas-works profits had exceeded expectations by reason of a reduction in the quantity of coal purchased and by numerous economies in administration, so that after the borough fund account received the contribution of £2311, there still remained £3600 to be carried forward to the credit of the gas-works account. Of this, £2500 was being applied in relief of rates, and if estimates proved accurate, there should be a sum of about £1060 existing at the end of the next financial year. The new Gas Manager (Mr. Matt Dunn) was to be congratulated upon the results of his first year of management.

The Metropolitan Water Board Deficiency.—A report was submitted by the Finance Committee at a meeting of the Metropolitan Water Board last Friday, which showed that the actual deficiency for the past year was £218,545, equal to a rate of 1d. in the pound, and £69,188 more than had been estimated. The report stated that the estimated deficiency for the ensuing year was £293,960. The average pre-war deficiency was £48,000; and the increase was due chiefly to the rise in the price of coal and labour. It was open to question whether it was fair to throw on the actual consumer the whole cost of the London water supply, thus relieving ratepayers who, though not direct consumers of the Board's water, shared in the benefits of a good supply.

Pembroke Docks and Town Gas Company.—In moving the adoption of the report and accounts for the year 1915, at the meeting last Thursday, the Chairman (Mr. G. W. Cobb) said the year had proved the most difficult and onerous one in the history of the Company. The situation had been aggravated by the fact that, while the normal increase of consumption had approached the limit imposed by the capacity of their plant, they had to supply Pembroke Dock—a naval and military centre which was subject to large and abnormal fluctuations of population. That in these difficult circumstances the supply had been maintained, and that there had been no breakdown, was due to the unremitting labour of their Manager (Mr. W. B. Mimmack), who had shown a degree of energy, patience, and resource which could not be too highly commended, and which had earned the special thanks of the Board. Sales of gas amounted to 68 million cubic feet, as compared with 58 millions in 1914. The capital to-day was but little more than double the annual turnover (£39,607, as against £19,162)—a proportion considerably below the average in gas-works of similar size and circumstances. Mr. Norton H. Humphrys, in seconding, observed that considerable misapprehension existed as to the extraction of toluol from the gas, in accordance with the request of the Ministry of Munitions. While sufficient material was thus obtained to meet the requirements of the authorities, the quantity taken from the gas was so small—perhaps 0·1 to 0·2 per cent.—that it was practically of no consequence to the consumers; and it certainly was in no sense an additional source of profit to the Company. The report and accounts were adopted, and dividends at the maximum rates were declared.

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Workmen's Wages and Holidays at Heywood.—At a special meeting of the Heywood Gas Committee, a deputation of the workmen appeared, and presented a request with reference to holidays with payment; and it was resolved that in future stokers be paid 5s. 8d. per shift, and have eight days' holiday with wages if in continual employment for twelve months, with four days' holiday for six months. It was also agreed that four days' holiday with wages be granted to workmen employed 26 week-ends in one year. The minutes have been unanimously approved by the Council.

Oldham Water Committee and Aircraft Insurance.—A singular position has arisen at Oldham in connection with the insurance of the water-works against aircraft dangers. At a recent meeting, the Water Committee agreed to insure their premises and works for £46,000, at a premium of just over £80. The Insurance Company intimated that the Committee could nominate whom they wished to receive the commission; and Mr. Arthur Andrew (the General Manager) was duly nominated. Subsequently, the Company said they could not accept the nomination, as pressure had been brought to bear on them; and they asked for payment of the commission which had been deducted. Mr. Andrew pointed out that the Committee had a reserve fund of £42,000; and he now thought they might take the risk themselves. It was decided to request the Company to return the premium.

Proposed Coupling-Up of Gas-Mains.—A proposal for dealing with likely damage to gas-mains by enemy aircraft has been made to neighbouring gas authorities by the Smethwick Town Council. The proposal is for the coupling-up of mains so as to make it possible for the various authorities concerned to render assistance to each other in the event of considerable damage being done to them. The Gas Committees of West Bromwich and Birmingham have been approached on the matter. The question has not yet been before the Birmingham Gas Committee; but it is stated that they have been in close touch with the other authorities in considering the scheme, and they are in entire sympathy with it. The West Bromwich Gas Committee, in a report issued last Saturday, state that, after consideration, they have decided to afford every facility with a view to assist in the proposal being carried out.

Exmouth Gas Company.—At the annual meeting of the Exmouth Gas Company, the Directors reported that the reconstruction of the carbonizing plant had been taken in hand, and was almost completed; and the results already obtained showed that the expenditure on this head was fully justified. The sales of gas had decreased 6·9 per cent., which was accounted for by reason of the extinction of the public lamps for the last three quarters of the year and economy exercised by private consumers. Notwithstanding this, however, the accounts of the past year's trading exhibited improved results over the previous year; and the Directors were able to recommend the payment of the usual dividends. Owing to the higher price of coal, the charge for gas was further increased by 4d. per 1000 cubic feet at Midsummer. The Chairman (Rev. C. R. Carr) paid a warm tribute to the services of the late Secretary (Mr. J. T. Foster), whose death they all deplored. The report was adopted.

Discount Reduced at Bolton.—At to-morrow's meeting of the Bolton Town Council, a resolution will be submitted by the Gas Committee that the discount on gas accounts be reduced from 3d. to 2d. per 1000 cubic feet, to take effect in the June quarter accounts.

Dublin Lighting Reduced.—The Dublin Public Lighting Committee, having considered the best means of curtailing expenditure on street lighting, in view of the Corporation's reduction by £4000 of the estimate for this purpose, decided that the arrangement likely to cause the minimum of inconvenience to the public would be the complete discontinuance of the lighting of a proportion of the street lamps for the coming twelve months rather than the serious reduction of the lighting hours of all the lamps which would otherwise be necessary.

Twelve Months' Consumption at Manchester.—The decrease in the consumption of gas at Manchester in the financial year just ended is 3·5 per cent., as compared with last year. This is attributed by Mr. F. A. Price (the Superintendent of the Gas Department) to the restricted public and private lighting, to the earlier closing of licensed premises, clubs, and institutions, and to economy on the part of consumers. The decrease, he added, would have been greater except for the daytime increase by the use of gas cookers and fires, and gas used in munition factories. At the last meeting of the Gas Committee, the Town Clerk was instructed to take the necessary steps to obtain a certificate under the Munitions of War Act for the gas undertaking.

The Charnley Manufacturing Company has been registered with a capital of £1000, in £1 shares, as manufacturers of, and dealers in, oil, gas, and electric lamps, and all apparatus used in connection with the distribution and employment of oil, gas, electricity, or water.

At the last meeting of the Manchester Gas Committee, a deputation attended from the Manchester, Salford, and District Plumbers' Association, with regard to certain suggestions made by them as to plumbers' work in connection with the supply and fixing of gas appliances; and it was decided that the further discussion of the subject should remain in abeyance until normal conditions again obtain.

The British Thomson-Houston Company, Limited, of Rugby, forward a copy of their new price list dealing with automatic control for electric capstans and winches. The control apparatus which is described has been specially developed by the Company to satisfy the requirements of capstan and winch service, and ensures that the motor is automatically started-up in the shortest time compatible with safety. There is included in the control gear a pedal switch designed for use in a covered yard or on an exposed wharf; and the substantial construction and general design of the equipment are such that the firm say it can be relied upon for satisfactory service without attention. It is therefore particularly suitable for installation in capstan pits and other underground chambers where opportunities for inspection are limited—thus obviating the necessity for separating the various parts of the capstan equipment.

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APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for March 29.]

Nos. 4079—4467.

ASHWORTH, A.—"Operating plate valves, &c., of gas-producers." No. 4171.
CARPENTER, H. A.—"Gas-generators." No. 4128.
CHRISTIE, H. F.—"Gas production." No. 4420.
DEMPSTER, R. & J.—See Ashworth. No. 4171.
FORD, A. P.—"Taps or valves." No. 4132.
HALL, I.—"Burners." No. 4159.
HISLOP, R F.—"Gas-producers." No. 4368.
LEE, E. J.—"Expanding tap for cutting internal threads." No. 4370.
RALPH, J.—See Lee. No. 4370.
RITER-CONLEY MANUFACTURING COMPANY.—See Carpenter. No. 4128.
THORP, J. W.—"Pitch firing of furnaces." No. 4202.
TILLEY, F. C.—"Vapour burners." No. 4452.
WHITTAM, J.—"Taps for production of internal screw threads." No. 4404.

Mr. B. Ellerton, of Dublin, for fifteen years the representative in Ireland of the Welsbach Light Company, of London, has resigned this position, and is starting business on his own account.

NEWSPAPERS FOR NEUTRAL COUNTRIES.

The Secretary of the War Office has issued the following order:

The public are informed that newspapers and other printed publications will not be sent to Neutral European Countries unless posted direct from the office of publishers or newsagents who have obtained permission from the War Office for this purpose. Persons desiring to send newspapers, &c., to Neutral European Countries should, therefore, give their orders for execution to publishers or newsagents who have obtained such permission.

The Publisher of the "JOURNAL" has obtained the required permission of the War Office; and he will, on receipt of instructions, forward copies direct from the office to any neutral country.

STOCK MARKET REPORT.

THE Stock Exchange did not have as bright a time last week as it did in its predecessor. This perhaps was in great measure attributable to the grievous storm of Tuesday, which sadly interrupted communication with provincial centres, and even with the Continent. Many of the chief markets were thus reduced to a state of quietude; and they were, moreover, awaiting the light to be thrown on the future by the Budget. But there was a good deal doing in speculative lines, where the public seemed ready to step in with some confidence. Home Rails were out of favour, and had a poor time compared with the week before. Americans were severely let alone, the numerous adverse factors affecting them being irresistible. Canadians, however, managed to emancipate themselves and make some recovery. In the Foreign Market, the French loan was again conspicuous for strength, and closed very firm, and Japanese looked up on resumption of Government purchases. Argentines were depressed, to which attitude disappointing dividend announcements contributed. South Africans did very well, coming in for some good support. In the Miscellaneous Market, rubber throve under the sunshine of much speculative eagerness; and oil did fairly well. But copper failed to attract much support. In the Money Market, the position was very firm, aided by the demand created by the month-end requirements. Discount rates were inclined to give way. Among topics of interest, the Budget very naturally occupied a prominent place, and a cheering element in its contemplation is the nice balance in hand which the Chancellor will have to start with. In regard to the Government's refusal to issue War Loan premium bonds, a powerful remonstrance is being prepared for presentation in the House of Commons. Innumerable precedents for the principle are pointed out; and the Government are, moreover, reminded that it is the largest proprietor in the Suez Canal Company, who have issued such bonds to the amount of millions sterling. Business in the Gas Market showed some quickening-up in activity, and the tendency was quite firm in general, while in particular cases there were slight advances in value.

Bargains done for cash during the week were as follows: On Monday, European 12 5/16, 12 7/16, 12½, Gas Light ordinary 72½, 72¾, 73, Primitiva (1911) 62½, South Metropolitan 76. On Tuesday British 35½, Gas Light Ordinary 72¾, 73, ditto maximum 60½, 61, ditto debenture 60, Imperial Continental 58, Monte Video 8⅞, Primitiva 41s. 3d, South Metropolitan 75¼, 75½, South Suburban debenture 90, 90½. On Wednesday, Brentford debenture 75½, Commercial 4 per cent. 72½, ditto 3½ per cent. 70, European 12 5/16, 12 7/16, Gas Light ordinary 72¾, 73, 73½, ditto debenture 59⅝, 59¾, 59⅝, 60½, Primitiva 43s. 6d., ditto preference 75s., South Suburban 81½. On Thursday, Bournemouth "B" 11⅝, 11¾, British 36, Commercial 4 per cent. 73½, 74, Continental Union 37, Gas Light Ordinary 72¾, 73½, ditto preference 75, ditto debenture 59⅜, 60, Primitiva 40s., 42s., 42s. 6d., 42s. 9d., 43s. 3d., ditto preference 71s. 3d., South Suburban 81, 81½, ditto debenture 90, 90½. On Friday, Commercial 4 per cent., 73⅜, 74, Continental Union preference 55, 55½, European 12 5/16, 12⅜, 12 7/16, Gas Light ordinary 72¾, 73½, Primitiva 40s., 41s. 3d., 43s. 1½d., ditto preference 71s. 3d., 72s., 72s. 6d., 73s. 9d., ditto (1911) 62, 62½. On Saturday, Commercial 4 per cent. 74, ditto 3½ per cent. 69½, 70, European 12 5/16, Gas Light ordinary 73¾, Primitiva 41s. 3d., ditto preference 72s. 6d., South Metropolitan 76, 76½.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When Dividend.	Previous Div or Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.				£ s. d.	
1,551,868	Stk.	April 8	2½	5⅛	Alliance & Dublin Ord.	59—64	3 18 2	..
874,000	..	July 10	4	4	Do. 4 p.c. Deb.	76—79	5 1 3	..
280,000	5	April 29	7½	3/-	Bombay, Ltd.	5½—6⅝	5 17 8	..
50,000	10	Feb. 26	16	15/-	Bourne- 10 p.c.	29—30	5 6 8	..
333,110	10	..	7	7/-	mouth Gas B 7 p.c.	15—15½	4 10 4	11⅝—11⅝
115,000	10	..	6	6/-	and Water Pref. 6 p.c.	13½—14	4 5 9	..
159,740	—	—	—	4	4 p.c. Deb.	..	—	..
992,045	Stk.	Feb. 26	†14	†6/-	Brentford A Consold.	261—266	5 5 3	..
734,920	..	..	†11	55/-	Do. B New	204—209	5 5 8	..
55,000	..	..	5	5	Do. 5 p.c. Pref.	109—111	4 10 1	..
221,400	..	June 11	4	4	Do. 4 p.c. Deb.	91—98	4 6 0	75½
217,380	Stk.	Feb. 26	11	10⅔	Brighton & Hove Orig.	208—213	5 3 4	..
244,200	..	..	8	7⅔	Do. A Ord. Stk.	154—159	5 0 8	..
630,000	20	Mar. 26	12½	22/6	British	44—45	5 11 1	85½—86
120,000	Stk.	June 26	4	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	—	..
100,000	10	—	—	4/6	Do. 4½ p.c. Pref.	4—6	—	..
100,000	Stk.	June 26	4½	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	..
157,150	Stk.	Feb. 26	5	5	Chester 5 p.c. Ord.	108—110	4 10 11	..
1,513,280	Stk	Feb. 12	5 9/4	49/4	Commercial 4 p.c. Stk.	106—108	5 1 2	72½—74
560,000	..	..	5¼	46/8	Do. 3½ p.c. do.	103—105	5 1 6	69½—70
475,000	..	June 11	3	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 8 11	..
800 000	Stk.	..	4	4	Continental Union, Ltd.	76—79	5 1 3	37
200 000	..	..	7	7	Do. 7 p.c. Pref.	115—118	5 18 8	55—55½
278,400	—	—	—	11½	Croydon B and C 7 p.c.	..	—	..
492,270	Stk.	—	6	5⅔	Derby Con. Stk.	128—125	4 16 0	..
55,000	..	—	4	4	Do. Deb. Stk.	102—104	3 16 11	..
1,002,180	10	July 29	10	10/-	European, Ltd.	17½—18	5 11 1	19⅝—12⅞
16,337,185	Stk.	Feb. 10	4/17/4	42/-	Gas 4 p.c. Ord.	98—102	4 15 6	72½—73⅝
2,600,000	..	..	3½	3½	Light 3½ p.c. max.	76—79	4 8 7	60½—61
4,062,235	..	..	4	4	and 4 p.c. Con. Pref.	96—99	4 0 10	75
4,674,850	..	June 11	3	3	Coke 3 p.c. Con. Deb.	72½—74½	4 0 6	59⅝—60
130,000	..	..	10	10	10 p.c. Bonds	..	—	..
258,740	Stk.	Mar. 12	5	4½	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	6	Hongkong & China, Ltd.	16½—16¾	6 11 4	..
86,600	—	—	—	9½	Hornsey 7 p.c.	..	—	..
131,000	Stk.	Mar. 12	7¼	7¼	Ilford A and C	151—154	5 2 4	..
65,780	..	..	6⅛	5⅝	Do. B	115—119	5 8 0	..
65,500	..	June 26	4	4	Do. 4 p.c. Deb.	92—94	4 5 1	..
4,940,000	Stk.	May 14	9	4½	Imperial Continental	150—160	5 12 6	58
1,235,000	Stk.	Feb. 12	3½	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	..
235,242	Stk.	Mar. 12	6½	6½	Lea Bridge Ord. 5 p.c.	119—121	5 7 5	..
2,498,905	Stk.	Feb. 26	10	5	Liverpool 5 p.c. Ord. A	211—213	4 13 11	..
					B	146—148	4 14 7	
306,083	..	June 26	4	4	Do. 4 p.c. Pr. Deb. Stk.	..	—	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4½—4⅝	6 9 9	..
250,000	100	April 1	4½	4½	Met. of Melbourne 4½ p.c. Deb.	99—101	4 9 1	..
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11½—12	6 13 4	8⅝
1,875,892	Stk.	July 29	4½	4½	Newc'tle&G'tesh'd Con.	98½—99½	4 10 6	..
529,705	Stk.	June 26	3½	3½	Do 3½ p.c. Deb.	82—83	4 4 10	..
55,940	10	Feb. 26	7/14/0	7/8⅝	North Middlesex 7 p.c.	14—15	5 2 8	..
300,000	Stk.	May 14	8	8	Oriental, Ltd.	117—122	6 11 2	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7⅝	6 9 0	..
60,000	50	Feb. 26	13	65/-	Portsea, Island B	128—131	4 19 3	..
100,000	50	..	12	60/-	Do. C	118—121	4 19 2	..
52,000	50	..	10	—	Do. D	..	—	..
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	6 18 4	40/—43/6
499,960	5	June 26	5	2/6	.. 5 p.c. Pref.	4½—5	5 0 0	71/3—75/-
521,600	100	June 2	4	4	.. 4 p.c. Deb.	91—98	4 6 0	..
—	—	—	—	4	 1911	..	—	62—62½
346,198	Stk.	June 26	4	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	6/-	San Paulo 6 p.c. Pref.	10½—11	5 9 1	..
125,000	50	July 1	5	5	5 p.c. Deb.	47—49	5 2 0	..
185,000	Stk.	Mar. 12	10	10	Sheffield A	223—224	4 9 8	..
209,984	..	..	10	10	Do. B	222—224	4 9 8	..
523,500	..	..	10	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	6-	South African	10½—11½	7 16 6	..
6,603,895	Stk.	Feb. 10	5/4/0	44/-	South Mets., 4 p.c. Ord.	111—113	4 16 8	75½—76½
1,895,445	..	July 10	3	3	Do. 3 p.c. Deb.	72½—74½	4 0 6	..
224,820	Stk.	Feb. 26	8½	8	South Shields Con. Stk.	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	5 3 5	81—81½
60,000	..	..	5	5	Do. 5 p.c. Pref.	110—112	4 9 3	..
135,000	—	—	—	48/4	Do. West Kent.	..	—	..
187,558	..	June 26	5	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	90—90½
629,740	Stk.	May 14	5	5	Southampton Ord.	99—102	4 18 0	..
120,000	Stk.	Feb. 12	7½	7½	Tottenham A 5 p.c.	135—138	5 8 8	..
782,275	..	..	6	6	District B 3½ p.c.	115—117	5 2 7	..
181,255	..	June 26	4	4	4 p.c. Deb.	87—89	4 9 11	..
189,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	5	Do. 5 p.c. Deb. Red.	93—95	5 5 3	..
236,476	Stk.	Mar. 12	5	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
					Wandsworth, Wimbledon, and Epsom—			
80,000	Stk.	Feb. 26	8⅜	78/9	Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	..	..	6½	63/9	.. B 3½ p.c.	129—134	5 2 7	..
108,075	..	..	5/17/8	55/1½	.. C 3½ p.c.	110—115	5 2 0	..
352,000	..	..	6½	57/6	Wimbledon 5 p.c.	117—122	5 0 6	..
98,000	..	..	6⅜	63/9	Epsom 5 p.c.	121—126	5 5 2	..
88,416	..	June 26	3	3	3 p.c. Deb. Stk.	66—69	4 6 11	..

* Ex. Div. † Paid on Old 10 p.c. and 7 p.c. Standard Stocks.

The Tilley High-Pressure Gas Syndicate, Limited, of No. 53, Kingsland Road, N.E., have received what they believe to be the largest order for tinmen's stoves ever placed. They are for use with high-pressure gas; and the installation will comprise three compressors and 345 stoves, and will be largely used upon the manufacture of munitions of war.

The twelfth annual meeting of the Sutherland Meter Company, Limited, was held last Wednesday. The report and balance-sheet for the year 1915 were unanimously adopted; and a dividend of 2½ per cent. on the ordinary shares and 5 per cent. on the preference shares was agreed to, and £4686 carried forward. Mr. A. C. Frost was re-elected a Director of the Company.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

MANAGER. Brampton Gas-Works.

CHEMIST. No. 6165.

MANAGER. Swadlincote Gas Department. Applications by April 18.

MANAGER (Bye-Product Coke Works). Yorkshire Coking and Chemical Company, 11 and 12, Pall Mall, S.W.

MANAGER (Hampshire). Address, "G. C.," 22, Basinghall Street, London, E.C.

Appointments, &c., Wanted.

REPRESENTATIVE, &c. Z. L., 743, c/o Deacon's.

REPRESENTATIVE. T. Ousey, Manchester.

Plant, &c. (Second Hand), for Sale.

TANKS. Steavenson and Co., Wandsworth, S.W.

TENDERS FOR

Coke Hoists, Screens, and Bunkers.

HALIFAX GAS DEPARTMENT. Tenders by April 17.

Coal.

LIVERPOOL GAS COMPANY. Tenders by April 7.

ROCHESTER, CHATHAM, AND GILLINGHAM GAS COMPANY. Tenders by April 19.

WESTON-SUPER-MARE GAS COMPANY. Tenders by April 13.

Retort (Vertical) Installation.

RIPON CORPORATION. Tenders by April 10.

Washer-Scrubber, Engine, and Condensers.

RIPON CORPORATION Tenders by April 10.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders to Alter or stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Saturday.

Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line, 6d.

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

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LARGEST SALE OF ANY OXIDE.

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OLD BROAD STREET, LONDON, E.C.

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
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